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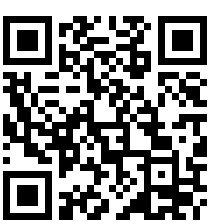
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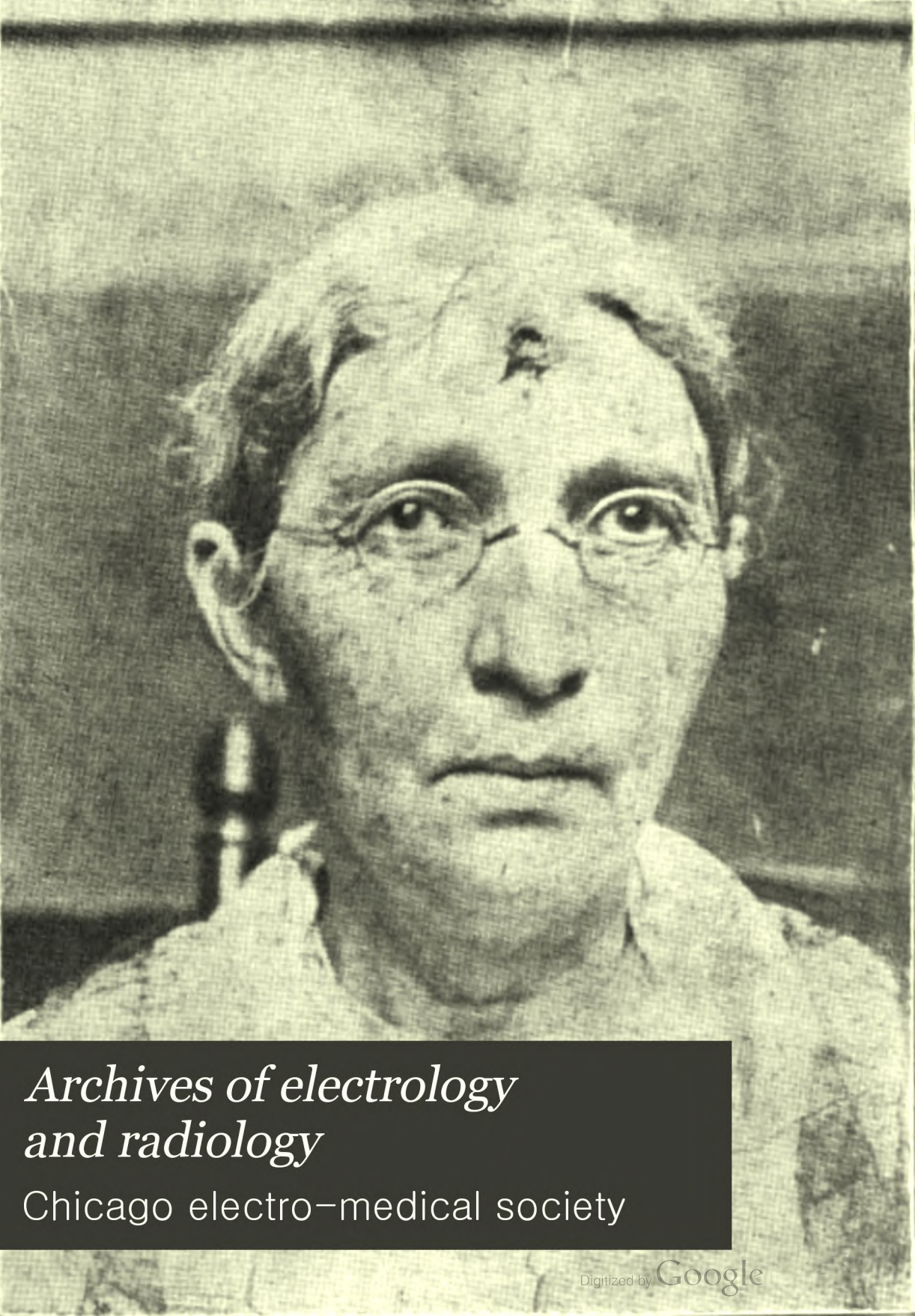
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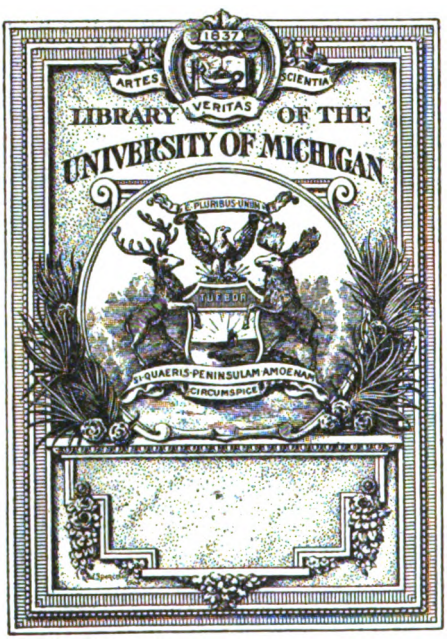




Archives of electrology and radiology

Chicago electro-medical society

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Archives of Electrology and Radiology

Vol. IV January, 1904 No. 1

Original Contributions.

DANGERS OF THE X-RAY OPERATOR.*

BY JOHN T. PITKIN, M. D.

For purposes of study let us divide the action of the rays of Roentgen upon the operator, into four arbitrary stages:

(1) Preparatory stage or stage of first impression.
(2) Premonitory or threatening stage.
(3) Stage of inflammation and disintegration.
(4) Stage of chronic skin diseases, etc.

PREPARATORY STAGE, OR STAGE OF FIRST IMPRESSIONS.

As you are all well aware, the operator receives no warning from the tube, experiences no sensations while being injured. After a time there is a little change of color of his hands and face. This he may erroneously attribute to the action of the solar rays.

"His face is like the tan."
(Longfellow, in the Village Blacksmith.)

A few papules or postules with itching here and there or bran-like scales to a local skin trouble (prurigo, acne or pruritus), a little swelling of the hands and features to a circulatory disturbance, the falling out of his hair to senility, when in reality they are caused by the Roentgen rays which are rendering the integument more and more susceptible to their action. Such symptoms should be looked upon as harbingers of an impending storm.

During a long period of increasing susceptibility, the oper-

*Continued from December issue.

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ator may imagine himself an X-ray immune. As if by some special dispensation, he, like Shadrach, Meshach and Abednego, can walk in the fiery furnace (of the X-ray field) and not be burned.

PREMONITORY OR THREATENING STAGE.

The symptoms of this stage are itching, warmth, local diaphoresis, a mild seborrhea, partial anaesthesia, luxuriant or deciduous hair (in hirsute people, the shedding of the hair may be the first indication of the rays' effects), cutis ancerina (goose skin), very small shot-like bodies in the cuticle, a glossy appearance of the parts as if they had been varnished, oedematous swelling of the subcutaneous cellular tissue, causing the hands and face, to become puffy as they do in Bright's Disease, rendering the fingers and palm of the hand stiff and awkward, effacing anatomical markings and giving a general rotundity of contour. Punctate red spots, a few and scattered (discreet) or many and close together (confluent) in groups, patches or diffuse; some are raised, others on a level with the surface. They may cause the skin to become as rough as the surface of a nutmeg grater. Some of the minute elevations may be colorless. They can be seen by looking at the parts obliquely. They can also be discerned by careful palpation. There is a flushed look to the skin about them.

DISCOLORATION OF THE SKIN.

Red, reddish-blue, yellow, brown or black. The first two colors, due to vascular charges, may or may not disappear. The others always remain on pressure. Pigmented portions of the body are especially affected with pigmentation. The same is true of dark individuals. It is by keeping diseased parts of the patients who have malignant ailments in this stage of irritability, oedema, tanning or redness and partial anaesthesia, that the greatest number of cures can be effected. From this stage the operator may recover, with or without desquamation. Exclusion of all parts of actinic rays, a good sweating of the parts, and crowding all the other emunctories, will help to restore the parts. Otherwise, as the result of further exposure, an operation or an accident, such as a blow

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or cut, to the irritated parts, the process will slowly, insiduously merge into the stage of chronic inflammation, with its "cardinal signs, calor, dolor, ruber, tumor and functio laessae" (quotation from lectures of Dr. Roswell Park, on Inflammation).

STAGE OF INFLAMMATION AND DISINTEGRATION.

The pathognomonic symptoms of X-ray inflammation as experienced by myself after seven years' exposure in the X-ray field, were extreme itching with constant desire to rub scratch or dig into the affected parts. If the itching of the alleged seven years' itch could be crowded into a few months' time, it would not be more aggravating.

ERUPTIONS.

Scarlatinaform rash, miliary papules, pustules and vesicles came in successive crops. They resulted from the more or less destructive inflammatory involvements of the follicles and their cellular elements, like thorns in the flesh or other foreign bodies. They were thrown off, leaving the skin honey-combed with small ulcers, oozing a hydro-serous discharge, alkaline in reaction. This discharge may be odorless or have a putrid smell according to the severity of the process. Some of the hairs could be drawn from their pockets as if they had been loosened by electrolysis.

EXFOLIATION OF THE SKIN.

Fifty, a hundred times, or more, the epidermis was thrown off in scales of various size, shape and consistency. In places slightly affected, the desquamation was scarlatinaform, the disease painless. Where quite severe, the scales were at first thick and macerated, pseudo-membranous. Late in the disease the scales became desiccated and appeared as they do, in many forms of skin disease. If the scales were torn away, the surface bled freely from the points of their attachment.

INFLAMMATORY MOUNDS.

Where the process is quite severe but attacks circumscribed areas more severely than intervening spaces, inflammatory mounds appear capped with a white membranous patch. In time the patch breaks down leaving a ragged-edged crater-

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like opening. A common position for these mounds is over the articular surfaces, but they may form upon the dorsum of the hand, the fingers and in other localities.

EXTENSIVE ULCERATIONS.

If the inflammatory process is severe, the eruptions, small ulcers and mounds all become confluent, the surface breaks down, forming large ulcerated excavations with a raised border. Their central position may be either naked or covered with a thick, whitish pseudo-membrane. Under these conditions the suffering is intense, the discharge sanious and offensive.

PAIN AND SUFFERING.

For a description of the pain and suffering, hyperaesthesia paresthesia, no language sacred or profane is adequate. The sting of the honey-bees or the passage of a renal calculus is painful enough, but are comparative pleasures, because being paroxysmal they have a time limitation.

Extreme tenderness to the slightest touch. Hot and cold waves and flashes, warmth, tingling, pricking, throbbing, stinging, crawling, boring and burning sensations, as if the parts were on fire and contained bugs, and other living things. Feelings as if the anatomical structures were being moved from one position to another. All of these sensations are proportionate to the depth of the inflammatory process. All forms of radiant energy, light, heat, magnetism, ultra-violet rays, etc., increase the suffering. The parts are irritated by soap solutions or attempts to use them for any purpose. The suffering is also augmented if the affected members are allowed to become dependent, hence the afflicted operator holds his hands high above his head, even sleeping with them in that posture. If the inflammation in his hands is severe, muscular action will be temporarily lost, the fingers immobile. He must be dressed, undressed and fed by attendants.

HEALING OF THE PARTS.

There are abortive efforts of the parts to heal. They heal over only to break down again, or healing in some places they break down in others. No healthy scabs form over the

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ulcers, no laudable pus, so called, appears. The formation of granulations and scar flesh is defective, consequently the processes of repair are indolent, ineffectual, requiring months to restore the parts. Eventually the epithelial cells will spread from the margin and islets, over the ulcerations, and the injured parts are thus supplied with a thin investment. Muscular power returns. Wherever the hair is restored, as it frequently is, it will return more vigorous.

Physiological rest, an elevated position, exclusion from all forms of actinic rays, the burning away of deciduous material with dioxygen, the employment of formaldehyde, ten per cent solution as an antiseptic wash, and a thick dressing of equal parts of vaseline and powdered starch, evacuation of pustules and the wearing of kid gloves for several months after the acuteness of the attack has passed, will afford considerable relief to the sufferer. Dr. Robinson of Philadelphia uses picric acid, Dr. Jering of the same city employes the lead plaster.

I quote the following, illustrating an extreme degree of chronicity of X-ray inflammation, also showing how the operators who work with the most powerful apparatus and the greatest number of hours per day, are usually the greatest sufferers.

London, Aug. 6, 1903, via Associated Press: "Two doctors belonging to the London Hospital have been affected by X-rays in a manner similar to that of the assistant of Thomas A. Edison, and have been compelled to abandon their work. They were engaged for a long time in making examinations of and manipulating diseased parts, while the X-rays were directed on their patients. When they began to suffer, they tried gloves on the backs of which lead foil was sewn, but these impeded the movements of their hands and were discarded. One of the operators ceased opertaing under the rays, eighteen months ago, yet his hands have improved little despite constant treatment."

To return to my own case, large red blotches and some pustules appeared upon my face and neck, with a burning sensation followed in time by desquamation and restitution. The

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parts were left sensitive to light, heat, etc. They, for a time, caused them to redden and peel in furfuraceous scales. My left hand was much involved; hundreds of minute abscesses formed upon the dorsum and the integument exfoliated many times. The nail of the ring finger came off but was renewed. The nails of all the digits except the thumb, became deformed, brittle and deficient in their usual luster. The shape of the hand was permanently changed, the ruga of the skin, the ridges on the nails, the knuckles and palmar arch are more prominent than they were formerly. Yawning caused muscular spasm of the fingers. Inflammatory mounds with their white caps and crater-like openings, came and went in the usual dilatory manner. Five months after the onset of the attack, the parts had healed but were so sensitive to the Roentgen rays that a fifteen minutes' exposure about one yard from the tube in a strong, high tension field, caused a secondary dermatitis. The period of inoculation, usually from one to two weeks, was reduced to as many days. The secondary dermatitis cleared up several large ugly patches of skin disease left them from the primary attack. 'Tis true that the X-light may, in a measure, prove to be a remedy for its own indolent process and sequelae. Eight months after the onset of the primary attack, improvement slowly but surely continued in the newly formed skin, the atrophic changes remained the same, but the hypertrophic changes had diminished. The skin was tolerant of all forms of actinic rays. The vaseline and starch dressing was still employed at night, but the wearing of gloves during the daytime was no longer necessary. In the primary attack, the right hand was less severely affected than in the left. Tenderness extended up both arms into the axillae. I suffered with malaise daily chill and fever (mild) headache, sore throat (mild), nausea and vomiting (severe but short), probably from cardiac impairment of function. There was a fine rash like that of typhoid fever, scattered over the entire body. Whether an attack of erysipelas sustained in both hands, about twelve years previous, predisposed me to X-ray inflammation, modified its course or prevented cancerous sequelae, I am unable to determine. Certain it is the

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two diseases (X-ray dermatitis and erysipelas) have many symptoms in common.

THE SEQUELAE OF X-RAY INFLAMMATION.

(1) More or less loss of integument with its appendages, hair, hair-follicles (alopecia), nails, sebaceous and sudirific glands.

(2) Disfigurement of parts involved, such as hands, face and head, by scars, pits, warts, pigmentation, baldness, a shave that requires no repetition, skin diseases, etc.

Small cicatrices form at the labial commissures, drawing the angles of the mouth downward, giving the operator a sad expression of countenance. Dr. Wagner of Chicago suffers with disfigurement of the face. A French operator is reported to have nearly lost his nose. Clarence Daily (case to be reported later) has scars upon his face and loss of hair. One entire hand and four fingers of the other have been removed. Dr. Early of Dayton, Ohio, has lost one finger. Dr. Kassabian has many small scars upon his face. Pigmentation has rendered his face much darker than its normal condition. A light streak separates the pigmented portion of his features from the hair of his head, giving him somewhat the look of a person wearing a mask. A picture of his hands is shown elsewhere. Girdwood, Grubbe, Kassabian, Skinner, Price, Waite, Platt, Detwiller and about one-third of the prominent operators and instrument dealers, well known by the writer, have hands which have been more or less severely injured. Blacker (case to be mentioned later) has gone on "the long journey to that bourne from which no traveler ere returned."

(3) Chronic scaly skin diseases and other conditions of the parts result because some of those little functionaries, the sweat and oil glands, that have moistened and lubricated your skin from the days of your inception are gone forever.

(4) Horny papillary thickening of the ends of the fingers, beneath and around deformed nails, crowding the nails away from their matrices. Horny ridges, lumps, nodules, warts or callous in other localities. Some of these formations mark the site formerly occupied by inflammatory mounds. Most of these formations can be softened and stripped off, but they

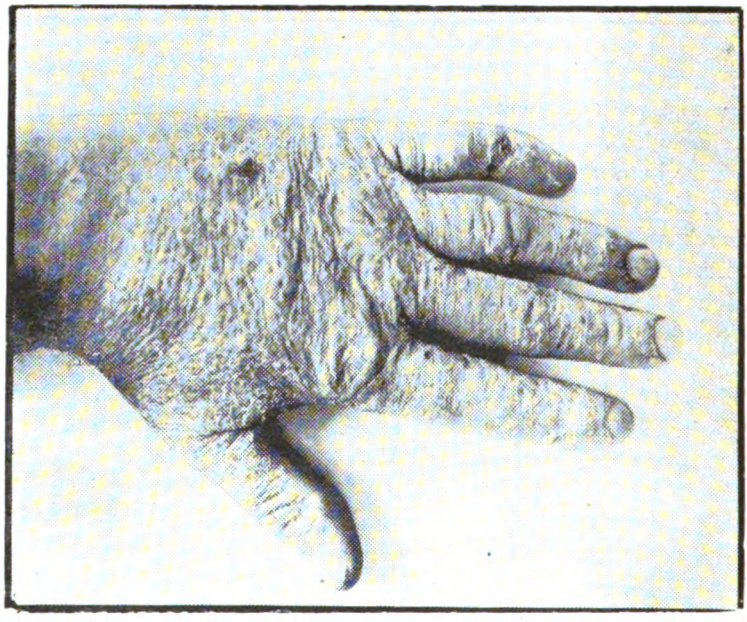
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usually form again in the same places. Their subsequent degeneration into cancer will be considered later.

(5) Purpura hemorrhagia and punctate clots in the newly formed skin. The bleeding probably comes from the nutrient arteries of the defunct follicles.

(6) Erythema, either circumscribed in small irregular spots, in the skin and beneath the nails or diffused over the entire surface.

(7) Hyperaemia or anaemia, usually the former, the latter being confined to circumscribed areas.



Case I. Dermatitis, second month, showing exfoliation of epidermis; inflammatory mounds; one white cap over the carpus; other mounds with crater like openings on index and little fingers, also one on dorsum of hand. The rugae of the skin are very pronounced.

(8) Pigmentation or blanching of the tissues, either temporary or permanent. The surface may be left with a pigmented border and white center as shown in an accompanying picture.

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(9) Hyperaesthesia to all forms of radiant energy and traumatism. This condition slowly decreases.

(10) Increased vaso-motor activity.

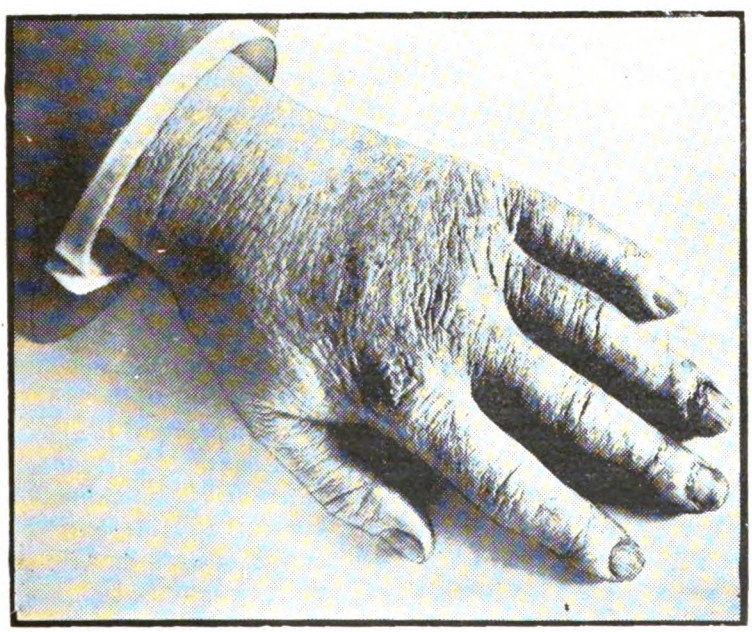
(11) Diminution or loss of the sense of touch in circumscribed areas. This sequel is rare.

(12) Small abscesses at the roots of the teeth (rare). See report of such a case, Philadelphia meeting.

(13) Temporary decrease of sexual power.

(14) Erratic or redundant growth of hair. See report of Dr. Girdwood and others.

(15) A tendency to spasmodic muscular contraction, and oedema.



Case II. Dermatitis, fourth month, the nail on the ring finger growing outwards as it is thrown off from its matrix. The skin has thickened about the other nails. A horny nodule can be seen on the index finger; desquamation still continues; the hair has been thrown off. Many papules can be seen on close inspection.

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SECONDARY, TERTIARY, QUARTANARY DERMATITIS.

From careful observations, made upon patients and myself, I conclude that each attack of X-ray inflammation leaves the parts more predisposed to subsequent attacks, consequently, after several repetitions, from a given volume, strength, tension, and duration of exposure, the period of incubation decreases, while the inflammation developed will be more and more intense. One hand of the operator may develop dermatitis in a few days, while the other hand, which has been less frequently, or less severely, attacked, requires a week or more for its appearance, the former will be severely, the latter slightly, affected.

Even the different fingers of the same hand may have a different period of incubation and degree of action, according to their relative susceptibility. After repeated attacks, the period of incubation may be entirely wiped out, the reaction with a sensation of warmth or stinging and an inflammation more or less profound taking place immediately. Conversely a period of rest from raying, limitedly, decreases susceptibility.

WHY THE HANDS ARE SO FREQUENTLY INJURED AND WHY UPON THE DORSUM.

(1) They are not protected by clothing.

(2) They are usually a little nearer the tube than other portions of the body, dorsum outwards.

(3) It is a common practice, with operators, to employ the hand in front of the fluoroscope, dorsum presented to the tube, as an X-radiometer, judging by the translucency of the bones, etc., the degree of penetration of the X-light.

When the operator is right-handed he will instinctively hold the fluoroscope in that member, consequently the left hand will, in the course of time, be more seriously injured. The reverse is true if left-handed. When ambidextrous, both hands will be nearly equally affected.

OTHER DANGERS OF THE X-RAY OPERATOR—IMPAIRMENT OF VISION.

At the Chicago meeting of this society Dr. Scott of Kansas City reported that he had been so afflicted, attributing the same to the Roentgen rays.

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Personally, I am unable without glasses to read medium print, which I could do seven years ago, before I became an X-ray operator. I consider the X-ray more or less responsible, but the fluoroscopic and dark-room work, not to omit the hand of time, have each contributed their quota to the impairment.

Mr. Thomas A. Edison reports that the focusing power of one of his eyes has been lessened by the Roentgen rays.

One of my X-ray colleagues has a mild form of ophthalmia, he believes to have been caused by the rays. Withdrawal from their influence is always followed by improvement. Drs. Kassabian and Waite have been similarly affected.

Ophthalmoscopic examination of my eyes, made during an X-ray inflammatory attack, revealed a deficiency of pigment in the choroid. The pupils of my eyes were small, and there wer indications of presbyopia, such as inability to focus perfectly the chrystalline lens for near and remote objects. Vision at thirty or forty feet was a little blurred and indistinct. This defect was overcome by distance glasses, but since my recovery such glasses are no longer required. I saw minute, bright, falling bodies upon the window pane, showing irritation of the retina.

THE EFFECTS OF THE ROENTGEN RAYS UPON THE GENERATIVE ORGANS.

When the X-ray operator has a mild but general attack of dermatitis the reproductive organs will darken. The hair over the symphysis pubis may or may not be thrown off. There will be desquamation of the scrotum and glands penis, although an investing fore-skin of the penis may not be affected. The sexual power will be temporarily lost. See report of experiments made upon the spermatoza of rabbits, American Roentgen Ray Society, Philadelphia. The urine contains no albumin.

COLLAPSING OF CROOK'S TUBE AND CUTTING OF FLESH BY THE CENTRIFUGAL FLYING FRAGMENTS OF GLASS.

This accident occurred to Dr. King of Bradford and was reported in The American X-Ray Journal, July issue of current year. The entire subject, including the danger to the

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eyes of the operator, has been considered by my predecessor, Dr. Pancoast.

POSSIBLE BUT NOT PROBABLE RESULTS OF OFT-REPEATED AND LONG-CONTINUED EXPOSURES TO THE ROENTGEN RAYS.

At the Chicago meeting of this society Dr. Grubbe reported that two patients whom he treated became deranged.

One of my patients developed a violent form of insanity with delusions and hallucinations; another was troubled with amnesic aphasia.

Both patients had been subjected to a long course of treatment for severe forms of carcinoma, and were of the nervous temperament.

Both cases terminated fatally.

Can the X-rays, like the solar rays, cause structural changes in the cerebrum, leading to derangement of the mental faculties, or do the ptomains from cancerous disintegration sometimes cause so profound an autoinfection as to bring about such psychical disturbances? Should you answer my primary question affirmatively, then it follows as a corollary, that the danger to the patient is in a measure shared by the operator, and solaroidal effects can be anticipated.

INFECTION.

The abraded tissues of the X-ray operator afford a fruitful culture field for infection with chronic malignant diseases with which his patients suffer.

His office is thronged with patients suffering with some of the vilest forms of disease that flesh is heir to.

CANCER.

In the Associated Press report of August 3, 1903, appeared the following: "One of Thomas A. Edison's X-ray operators, named Clarence Daly, who had used the X-rays for several years, is to-day a physical wreck. Cancer broke out on both arms, one of which was amputated, and four fingers of the other hand had to be removed. His face is wrinkled and his hair fallen out."

In a personal letter received from Mr. Edison he assures me that this report is true.

I quote the following apropos, from The Electro-Thera-

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peutic and X-Ray Era, September number, 1903: "The premature demise of an English physician from malignant disease is alleged to be traceable to an X-ray accident. Blacker suffered a severe burn on one of his fingers while manipulating the apparatus. This irritation produced an unyielding dermatitis, which rapidly ascended the arm. Cancerous disease of the skin now appeared at the elbow, and evidences of malignancy were soon perceptible in the axilla, the disease finally involved the entire shoulder, the progressive character of which precluded operation."



Case III. A patient with cancer on the forehead who says it was caused by the sting of a mosquito. Under treatment the parts healed, but through neglect on patient's part, they broke down again. Present condition unknown.

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For other cases illustrating this danger I refer you to the current literature, dealing with the subject, rather than weary you with further quotations.

In order to throw the searchlight of investigation upon one of the etiological factors of cancer I will inquire of a patient who has that disease upon the forehead (see picture) what was the cause? She replies the sting of a mosquito.

I ask another suffering with epithelioma of the lips and cheek the same question. He says a cut from a barber's razor



Case IV. Patient with osteo-carcinoma of the bones of the face, says it was caused by being struck with a stone. Under treatment the diseased bones came out en masse. One side of his face has had the shave that requires no repetition. His present condition is unknown.

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Still another, with osteo-carcinoma of the bones of the face (see picture). Says he was struck with a stone.

A patient with one-half of his face involved fell upon a plank that cut his lip. Cancer subsequently developed in the cicatrix (see picture).

A lady with scirrhus of the breast and a matastatic focus on the face believes the primary lesion to have been caused by falling against a bedstead.



Case V. Patient with one-half of his face involved with cancer, said that he fell upon a plank that cut his lip, and cancer subsequently developed in the cicatrix. Under treatment there was a desperate effort made by the tissues to heal, but his strength failed and he died November 30, 1903.

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In other words, slight injuries to epithelial tissues, in accord with the teachings of Conheim, the German savant, often prove a potent cause of cancer.

Is it strange, therefore, that X-ray inflammation, with its specific action upon this variety of tissue, be it physiological or pathological, should very rarely cause a cancer in an operator having the cancerous disthesis by degeneration of the horny ridges, nodules, warts, cicatrices, etc., left as sequelae or a retrograde epithelial metamorphosis superinduced by the inflammatory process?



Case NI. Post dermatitis condition of hand of Dr. Mihran K. Kassabian, X-Ray expert, Chestnut St., Philadelphia, Penn.

Patients subjected to a course of X-ray treatment of over one year's duration, who are not thoroughly shielded from the action where not required, may become emaciated, the parts exposed have eruptions, oedematous swelling and spasmodic contraction (slight), painful or otherwise. This danger is limitedly shared by the operator.

(9) Remain behind the target, the static machine or thick plate glass screens, having metallic bases, through the glass of which I can observe all that is transpiring, or examine my patient who holds the fluoroscopic screen, while I remain excluded from the X-ray field.

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(10) If obliged to enter the field for any purpose, remain as far away from the excited tube, and work in the outer confines as much as possible. Do what is required then return to a position of safety immediately.

Another good plan for self-protection is to screen yourself from such pencils of X-light as would come your way with a copper plate placed so that you can see the working of the other portions of the tube, or screen the entire tube and observe its reflection in a looking-glass. A combination screen and tube holder, to invest the tube on all sides, with a suitable aperture for the egress of the rays, can be made of very thick glass.

The new form of clinical adjustable tables, with a copper or sheet-iron covering nailed onto the wooden top, the top turned on end, make admirable impromptu screens for many purposes.

The foreign makes of tubes, said to be made of glass, which is opaque to the rays except at a limited area, are worthy of trial.

Such precautions I now scrupulously maintain, for my recent experience with this subtle force, reminds me of the words of Shakespeare, given to the ghost of the erstwhile Hamlet, King of Denmark (paraphrased):

"My hour has almost come,
When I, to sulphurous and tormenting flames
Must render up myself.
Doomed, for a certain term, to walk the night;
And for the day, confined to fast in fires,
Till the foul ****** (unnatural condition) of
My body, is burned and purged away."

Buffalo, N. Y.

DISCUSSION.

Dr. Weston A. Price, Cleveland, Ohio, showed a flexible rubber cloth that is entirely opaque to the rays, heavy, will not break or bend. It can be made into aprons or jackets and vests or gloves. It offers perfect protection both to the patient and to the operator. He believes that with time there is an increasing tendency to be affected by the ray. Possibly there is a cumulative action that later in life may lead to very serious difficulty, or even tend to have a fatal ending. He also ex-

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hibited a tube holder made of vulcanized opaque rubber. It is a non-conductor and there is no tendency to spark across.

Dr. James A. Marsh, Troy, N. Y., called attention to the fact that he was suffering severely from an affection of the feet due to X-radiance to which he exposed himself unconsciously while his tube was excited.

Prof. Goodspeed expressed his opinion that this effect probably was due to the fact that the whole room and its contents are rendered negatively active during the action of the tube.

Dr. Chas. L. Leonard, Philadelphia, suffered from burns of the hands and feet, but protects himself now by enclosing his tube in a paper box wrapped around with lead foil so as to exclude the rays from his body. It also affords protection to the patient. It is of equal importance to know something that will cure these burns. Personally he has found soaps containing resorcin very effective; also inunctions with lanolin and boric acid.

Dr. Kassabian keeps his coil up near the ceiling of the room and puts the tube into the box of his apparatus that he exhibited in connection with his paper in chest skiagraphy. By means of a reflector attached to his tube by a rod he is enabled to see the color of the rays without exposing himself to the ray.

Dr. Louis A. Duhring, Philadelphia, compared the X-ray burn with eczema in the variety and multiplicity of its clinical manifestations, although pathologically the two processes are entirely dissimilar. Therapeutically the X-ray burn is as capricious as it is in its pathologic manifestations. No one single remedy will cure all cases. Every operator appears to have some remedy that has helped him, but that same remedy fails to do anyone else any good. He could not suggest anything that will cure all cases, but advised that operators try various remedies until they find the one that will do them the most good.

Dr. Egelhoff obtained relief by washing his hands in water as hot as he could stand it, before retiring, using plenty of green soap and a hand brush; this he followed by liberal in-

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unctions of olive oil, and then covered his hands with a pair of kid gloves.

Dr. Fairfax Irwin, U. S. P. H. and M. H. S., had two cases of intractable ulcers due to the X-ray that he finally cured by shutting off the light. He enclosed the affected areas in a wooden box, and much to his surprise the ulcers healed up very promptly, after having existed for five months.



METHODS OF ROENTGEN RAY TREATMENTS OF MALIGNANT DISEASES OF THE UTERUS, RECTUM AND BLADDER.

(Abstracts from a paper by Margaret A. Cleaves, M. D., in the "Medical Electrology and Radiology.")

The author first notes that even should the rays penetrate the body, their action on deeper tissues must be very much less than on superficial tissues. It is also noted that toxic products of diseased tissues are often released during the treatment and a toxemia results. It is also pointed out that the reports of cases have shown the complete disappearance of a surface carcinoma after a course of treatments, but the growths returned much more rapidly in the neighboring tissues after several weeks of rest. Thus, Hyde, Montgomery and Ormsby in such cases have proved that the doubtful tissue is typical carcinoma, and it is their belief that metastases have occurred during the successful treatment of the primary growth.

The writer holds that much less danger would be incurred by treating the pelvic organs in the female through the rectum and vagina.

The author uses a Caldwell tube for rectal and vaginal work, and a special tube with a very small projection for insertion through the urethra in desical cases. Three cases are mentioned, described in detail elsewhere, in which the method was of great success. One case was inoperable, a recto-vaginal perforation having taken place and the rectum and uterus badly involved. The case yielded promptly to X-ray treatment, the recto-septum being restored.

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Editorial.

With the present issue we begin a new volume, and because of the great interest taken by physicians in other forms of radiant energy besides the X-ray, we have changed the name of the journal from "*American Electro Therapeutic and X Ray Era*" to the "*Archives of Electrology and Radiology.*" There will be an increase in our editorial staff, as our future issues will show.

The word electrology is used to denote the science and application of all forms of electricity to therapeutic uses. The word radiology denotes all forms of radiant energy, such as ultra violet light, the X-ray, sunlight and the radiations from the elements uranium, thorium and radium.

This name has been suggested by Dr. Clarence E. Skinner of New Haven, Conn., who is vitally interested in the welfare of the journal.

As in the past, we are not advocating the use of any special agent, but we aim to give the results of actual experience by competent men.

In the present issue we conclude Dr. Pitkin's paper read before the American Roentgen Ray Society, the first part of the article being in our December issue. We also give a very full report of the other papers which we do not expect to publish in full. We shall not give these in the order in which they occurred on the program, because the order is of little importance except to those who were actually at the meeting.

The next meeting of the Chicago Electro-Medical Society will take place on Tuesday evening, February 23, at 8:15 p. m., in room 412 Atlas building. A paper will be given by Dr. May Cushman Rice on the "Glass Electrodes as an Adjunct to the X-Ray." A further discussion on the operation of the static machine will be led by Dr. Burdick.

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MINUTES OF THE CHICAGO ELECTRO-MEDICAL SOCIETY.

The December meeting of the society was held in room 412 Atlas building December 22 at 8:30 p. m. Dr. Burdick as president was in the chair. The committee on membership gave a report of progress and a general discussion on methods of arousing interest in electro-therapeutics and the X-ray ensued. The following were proposed for membership: E. T. Rellahan and N. O. Nelson. The election of officers was deferred for 3 months. A paper was then read by Mr. C. H. Treadwell on "Explanation of the Generation of Charges in the Static Machine." The paper was discussed by Drs. Grubbe and Burdick, Mr. Nelson and Mr. McIntosh. It was agreed that the discussion of the paper be continued at the next meeting.

PHYSICAL PRINCIPALS INVOLVED IN THE OPERATION OF THE STATIC MACHINE.*

BY C. H. TREADWELL, B. S.

Mr. President and Members of the Society:

I shall attempt to set forth the principles on which the static machine operates, confining the discussion entirely to the Holtz and the Toepler-Holtz machines, the Wimshurst machine operating on a slightly different principle. It must also be stated that this exposition is not at all original, for I shall endeavor simply to give what I understand are the views of physicists on this subject.

*Read before the Chicago Electro Medical Society, Dec. 22, 1903.

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The static machine should be called an induction machine, and it is therefore necessary to explain the production of inductive charges under conditions as simple as possible. I will therefore perform a few introductory experiments with these insulated electrodes of the static machine, using these because of the simplicity of the operation and because any physician can repeat the experiment.

This hard rubber rod I will suspend at its center so that it may swing horizontally. It will be charged negatively when rubbed with this piece of flannel (see Fig. 1). We see that the insulating handle of this electrode (see Fig. 2) is also charged negatively and that there is repulsion between the two. This illustrates the general law that like charges (two negative charges or two positive charges) will repel, whereas unlike charges will attract.

We will now generate a positive charge by induction upon this large ball spark electrode, which serves as an insulated conductor. You see it is necessary for me to hold the charged hard rubber rod—that is, the inductor—above the insulated conductor and then touch this last body with the finger (see Fig. 3). The finger is then withdrawn and the inductor afterward removed and the body is now charged. By testing its charge upon the suspended hard rubber rod (see Fig. 4) we see that there is attraction, and we therefore conclude that this body is charged positively. This is charging by induction and we see the steps of the process; first, a charger inductor; second, an insulated body; third, the inductor brought near the insulated body; fourth, connection made with the earth, which is then broken, and afterward the inductor is removed.

It might be interesting to ask where this charge comes from. Some might say that there is a sort of circuit produced through the body of the experimenter, but that supposition is at once overthrown when the operation is repeated with the experimenter on an insulated support and some one else touching the body. Here there is no circuit in the usual sense of the word. Again it may be said that the charge comes from the earth or from the surrounding atmosphere or from the inductor itself. This last supposition may be dismissed when

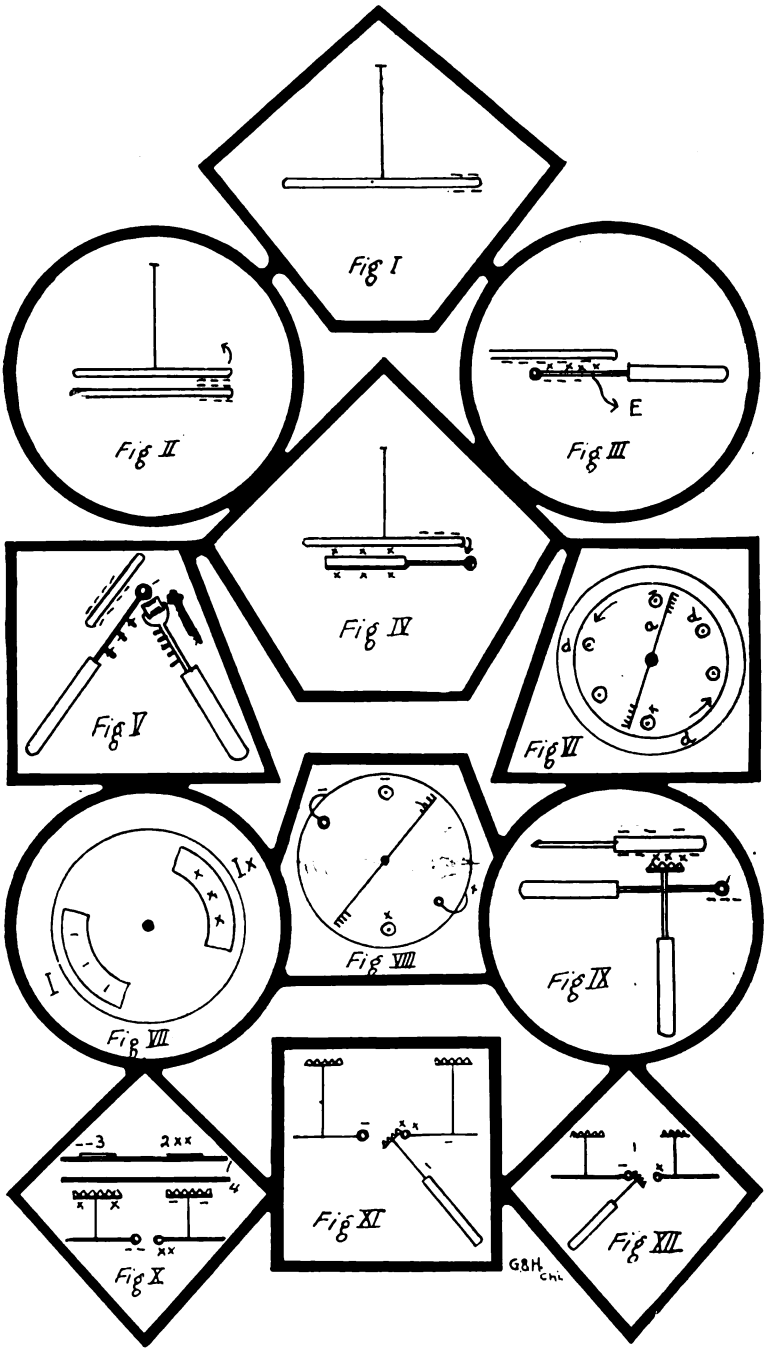
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we consider that the induction is charged negative, while the insulated body becomes positive. How could a positive charge come directly from a negative body? To test the adequacy of the other two suppositions we now perform this following experiment:

The large ball electrode is held gently against the roller electrode, thus forming two insulated bodies in contact. The charged inductor is now brought parallel to the ball electrode and the roller electrode is then separated from the ball electrode (see Fig. 5). We have now induced charges upon these two bodies and by testing with the horizontally charged rod we see that the ball electrode attracts and the roller electrode repels. Whence came these charges? Evidently not from the ground, because there is no earth connection. Evidently not from the air, else why should one be positive and one be negative? The easiest way of explaining this phenomenon and one accurate enough for our purposes is to say that a neutral conductor has both positive and negative charges of equal amount. The negative inductor attracts the positive charge upon the adjacent surface of the ball electrode, and repels the negative charge to the roller electrode.

We will now return to the preceding experiments where the ball electrode is charged positively (see Fig. 3). When the negative inductor was held over the ball electrode the positive charge was drawn to its upper surface and its negative charge repelled to its lower surface. When earth connection was made the negative charge was repelled into the earth, the positive charge being held by the negative charge of the inductor. The earth connection being broken and the inductor removed, a free positive charge was left on the ball electrode. The method of induction therefore consists in bringing an inductor into the neighborhood of a neutral insulated conductor, earth connection being made and then broken, the inductor finally removed, leaving the insulated body with a free charge. This operation must be shown to take place on the static machine. We need first, however, to apparently modify the experiment—namely, if we put two glass plates

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between the inductor and insulated conductor, the operation of induction will still produce charges.

We shall consider this little model because there is no case around it and we can touch all its parts. It is identical in principle with the large Toepler-Holtz machine (see Fig. 6). The smaller circle represents a rotating plate on which are glued the metal disks. The larger circle is a stationary plate on which are the paper sections shown in Fig. 7.

Corresponding to the finger is this brass rod called the neutralizing rod (see Fig. 6a). These metal disks on the rotating plate are the insulated conductors, while the inductors are the paper sectors on the stationary plate (see Fig. 7, I). These are sometimes called condensors or armatures, or the field, but I have much doubt of the suitableness of the term. They can scientifically be called inductors. One of these inductors becomes charged positive and the other negative by friction between the tinsel brushes on the arms fixed to the inductors, or, if you please, by the contact charge due to the touching of these different metals in the tinsel brush and the disks on the rotating plate. However, if only a very feeble charge is given to one of the inductors, the machine will generate. Referring to the experiment on induction, we see that the important time in the process is when the finger touches the insulated conductor, and so it is when the metal disks on the rotating plate pass beneath the tinsel brush on the neutralizing rod that charges are generated. Let this left inductor be positive and the disk be in position indicated by the figure. (See Fig. 6.)

Note.—The plus signs on figure IV should be on the metal part, not on the insulated handle. In figure V the ball electrode should be positive and the roller electrode negative.

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Evidently a positive charge will be repelled through the tinsel brush into the neutralizing rod, and when the disk leaves the tinsel brush a negative charge remains on it, because a positive charge has been driven from it. This charge is imparted to this collecting tinsel brush connected wtih the right inductor (see Fig. 8), and every successive one thus brings a negative charge to this conductor, making it more and more negative and preventing its charge from deteriorating due to leakage.

A similar process is going on at the lower part of the neutralizing rod where the disk is touched by the finger in front of a negatively charged body, and therefore a negative charge is repelled up the neutralizing rod. Thus a free positive charge now remains on the disk, as shown in Fig. 8, and this charge is conveyed by the rotating plate to the collecting tinsel brush connected with the positive inductor. Every successive disk brings a charge to this inductor. And so the operation of the machine, so far as the disks are concerned, is to store up charges upon the inductors on the stationary plate. But you are more interested in how the charges are conveyed to the prime conductors. We must here bring in another principle of physics.

Imagine the hard rubber handle of a static machine electrode is charged negatively by friction (see Fig. 9). Let the multiple point electrode and the large ball electrode be held crosswise, as in Fig. 9, the points being near the charged body I, as indicated. If this inductor is charged negatively it will draw a positive charge upon the points and repel a negative charge to the ball, these two opposite charges residing previously upon the neutral conductor. This positive charge cannot remain upon these points, but will be discharged as a brush through the air.

Referring now to our drawing (Fig. 10), we see that the same thing holds true in the static machine, only that there are here two glass plates between the inductor and the points. The machine is viewed from above, the neutralizing rod and the brushes and arms connected with the paper sectors being omitted; 1 is the stationary plate on which are the paper

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sectors 2 and 3, which are charged positively and negatively respectively; 4 is the rotating glass plate. The prime conductors are also indicated. This does not, however, affect the inductive action of the inductors. These points, therefore, should not be called collecting combs, but rather discharging combs, and if this explanation be true, these points must be oppositely charged from balls of the prime conductors. This point will be duly proved after all parts of the machine have been described. We must state emphatically here that the charges upon the prime conductors are not brought to them by the revolving plates, but rather that the conductors become charged positively and negatively, because respectively negative and positive charges are drawn off from the horizontal row of points facing the revolving plates.

FUNCTION OF THE POINTS ON THE NEUTRALIZING ROD.

These points have a most important function, as shown in the diagram (Fig. 8). The upper end of the neutralizing rod is in front of the right inductor and the points on the lower part are in front of the left inductor. If the right inductor is positive it will draw from those points a negative charge upon the revolving plate, which will then pass to the left so as to be in front of the left inductor, and both of these being negative, they will draw very powerfully upon the positive of the left prime conductor, drawing a positive charge upon the horizontal points facing the rotating plates, which leaks off upon the rotating glass plates, leaving the ball of this prime conductor negatively charged (see Fig. 10). Just the reverse action takes place at the lower part of the neutralizing rod—namely, these points being in front of the negative inductor of the stationary plate, a positive charge is drawn from these points upon the glass plate, and this is carried by the rotation of the plate in front of the right horizontal combs of the prime conductor. This positive charge, together with the positive of the right inductor, draw continuously negative charge from the horizontal row of points, leaving the ball of the right prime conductor positive.

THE OPERATION OF THE HOLTZ MACHINE.

This machine has no buttons upon the rotating plate and

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is therefore not self-charging. A small Toepler-Holtz or Wimshurst is placed at one side of the case to give an initial charge to the inductors on the stationary plate. A very important difference between this and the Toepler-Holtz machine is that the inductors of the Holtz machine have a row of paper combs pasted horizontally across the inductors. From these combs a negative charge is drawn off upon the rotating plate if the right inductor is positive, while a positive charge is drawn off from the negative left inductor. Perhaps the two best known Holtz machines are the Waite & Bartlett and the Van Houten & Ten Broeck. The stationary plates of these machines are in two sections, so that there will be a good opportunity for the charges to be drawn from the paper inductors upon the rotating glass plate. At the same time charges are drawn upon the opposite side of the rotating glass plates from the points of the neutralizing rod just as in the Toepler-Holtz machine. Hence the very important difference between the Holtz and the Toepler-Holtz is that the former uses both sides of the revolving plate to carry charges, whereas the latter uses only that side nearest the horizontal points of the prime conductors. In other respects the operation of the two machines is identical.

Another class of machines is the combination Holtz and Toepler-Holtz. In these machines one or two of the revolving plates are provided with metal disks, whereas the rest are free from these, but the stationary plates facing these have their inductors provided with the row of paper or tinfoil points. These machines are self-charging and at the same time possess the inductive properties of the pure Holtz machine. Some of these machines do not have a window or hole in the stationary plate for the charges to be drawn off from the inductors upon the inner surface of the glass rotating plates. It would seem that the output of these machines would be increased by adopting the window or the slit in the stationary plates, such as is found in the Van Houten-Ten Broeck and Waite & Bartlett machine. The Engeln machine has the very interesting method of obtaining the inductive features of the pure Holtz without the division of the stationary plates. A

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tinfoil slit runs from the center of the inductor to the circumference of the stationary plate and a metal arm connected with these and provided with points is set at about right angles to the neutralizing rods.

In conclusion, then, this explanation seems to differ from the one usually given in that the horizontal row points connected with the prime conductors are here said to be charged oppositely to the charge upon the balls to which they are connected, and they are thus not collecting points, but discharging points.

PROOFS.

The proof of all this is that a point connected to a positively charged body is surrounded by a bluish brush in the dark, whereas a negatively charged point has a little star at its end. This can be very easily proved by any physician. First determine the positive prime conductor by pulling apart the discharging rods and observing the color of the spark discharge between the two balls. With the condensors off, the positive end of the brush will look redder and the negative end will look whiter. There are, of course, other ways of determining the charges of the prime conductors.

While these poles are widely separated place the multiple pointed electrode close to the positive ball, as shown in Fig. 10, and its points will then become positive and will show a bluish brush; place this electrode in contact with the negative pole and the points show a little star (see Fig. 12). Hence a positive point means brush and the negative point a star. Look now into the case and the horizontal teeth in metallic connection with the negative pole are positive—that is, they are brush, whereas those in contact with the positive pole are negative—that is, they show a star.

Again, if the right inductor is positive, the teeth of the neutralizing rod in front of this will be seen to be star—that is, negative; while the lower set of teeth or combs of this rod which are in front of the negative inductor are brush—that is, positive.

Another method of finding the kind of charges on the outside electrodes is to hold in the hand the single-pointed brush

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electrode near the prime conductors. The positive prime conductor will draw from the body of the experimenter a negative charge to the point of the electrode held in the hand, which will then show a star. A knife held in the hand will answer the same purpose, and this knife can be held in the hand and presented to different parts of the machine, thus showing the different kinds of charge which reside on the rotating glass plate or inductors of the stationary glass plate.

DISCUSSION.

Dr. Grubbe asked whether the horizontal so-called collecting combs could not be displaced by a cylinder, or instead of points put rounded balls. The answer was that they certainly would work if these were collecting combs, but although the experiment had not been tried by the speaker, that the theory certainly demanded that this would not work.

Dr. Grubbe then told of the machine of Otto Von Guerke, which consisted of a large cylinder of sulphur mounted on a shaft, which was provided with a handle so that the cylinder could be turned rapidly. The hand was held against the cylinder and the friction generated a charge on the sulphur. A large cylinder was placed near the cylinder and very heavy sparks could be obtained from this.

Mr. Nelson was then asked whether he had tried such an experiment with his static machine, and replied that if balls were used instead of points, the output of the machine would be very much reduced. He then went on to say that he believed the explanation given in the paper was correct, and said that the theory ought to explain why grounding the negative pole would very much increase the potential of the positive pole. He said he had noticed that one or two discharging points facing the glass plate acted just as well as a greater number and that the position of the neutralizing rod was very important; that when the rod was nearly horizontal it seemed to affect the charge of the tinfoil condensor of the inductor. He did not agree with the speaker that the lessened output of the machine when the neutralizing rod is nearly horizontal is due to the short-circuiting action of this rod between the two

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sets of horizontal points on the prime conductors facing the rotating plates.

Dr. Burdick's discussion will appear in our next issue.

Mr. McIntosh said that owing to the lateness of the hour the discussion had better be continued at the next meeting of the society, as he wanted the matter more fully discussed. The society took the same view and further discussion was adjourned.

RADIO-ACTIVE GAS FROM THE BATH MINERAL WATERS.

H. S. Allen, in Nature, reports that he took samples from the King's Bath Spring in this research. The gas was expelled from about 1½ pints of the spring water by thoroughly boiling this at half atmospheric pressure. The gas was passed through a number of small drying tubes and was then collected. Only a small quantity of gas was thus obtained. It was then tested for its radio-active property, and was found to have these. The gas did not acquire its greatest activity until about one-half hour later, while in another half hour it diminished to one-half its maximum value. Rutherford had observed a similar effect from the radium emination and the author led to the query as to whether the mineral water did not contain radium emination. If this radio-active gas is of medicinal value it may account for the fact that the waters taken fresh from the springs seem to have a greater efficiency than after being shipped to other places.

AMERICAN ROENTGEN RAY SOCIETY.

The fourth annual meeting of the American Roentgen Ray Society was held in the auditorium of the Houston Club at the University of Pennsylvania, Philadelphia, December 9-10, 1903, under the presidency of Professor Arthur W. Goodspeed.

The meeting was well attended, the program was most excellent and the discussions were spirited and of much value. The reports of the secretary and the treasurer were very gratifying, inasmuch as they showed the society to be in a very

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flourishing condition. The membership numbers about 400.

The first paper on the program was read by Dr. Wm. S. Newcomet of Philadelphia, entitled:

"PATHOLOGIC CHANGES IN TISSUE UNDER THE INFLUENCE OF THE X-RAY."

The degenerative changes of the X-ray are not characteristic. Slight burns resemble sunburn, but severe burns are peculiar and may run through an incubation period of several months. If the ulceration does not go below the superficial structures no scar is formed, but a scar is inevitable if the deeper structures are involved. The important early changes in tissue destroyed by the ray are, first, fatty degeneration with vascularization of the epithelial pearls; second, a leucocytic infiltration of a varying degree. Bodies indistinguishable from Plimmer's bodies are found. The X-ray has a tendency to stimulate tissue growth. Rapidly growing deep or superficial growths early produce metastases. No single form of degeneration is characteristic of the X-ray. The form of degeneration depends on the method of application of the ray, and the particular tissue that is exposed. It would seem that the effect of the ray is on certain cell elements in exposed parts, but why certain normal cells, like the cells of the hair follicles, should be more susceptible to the ray is still a matter for speculation. The ray produces a great degree of vascular disturbance and this may play an active part in the changes that are peculiar in tissue exposed to the action of the ray. Slow-growing growths always do well, whereas the rapid-growing growths do not. They are irritated by the ray and stimulated to excessive growth.

DISCUSSION.

Dr. Gordon G. Burdick, Chicago, took exception to the last statement. He has never seen the ray stimulate a growth, because he does not use such a penetrating ray. The rays should not be sent beyond the point at which they are expected to exert their energy. By using a ray having a lower penetrating power osteosarcomata and spindle-celled sarcomata shrink very rapidly. Pathologically, it appears that the epi-

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thelial tissue suffers at the expense of the connective tissue, but whether this is because of a choking of the epithelial cell by the connective tissue cell or a primary death of the former is not known.

Dr. Jos. C. Clark, Olean, N. Y., finds that the short history cases are best left alone, because the ray always irritates them. He treats these with caustics.

Dr. Weston A. Price, Cleveland, Ohio, suggested the possibility that all tubes have in them a variety of rays, both the high and the low penetrating rays. Therefore it is impossible to select a tube having a certain ray only.

Dr. Henry Hulst, Grand Rapids, Mich., said it is useless to measure the penetrating power of any given tube. The first effect on the tissue of the X-ray is that of stimulation; the second is that of depression, and if this continues death of the tissue may follow. The difference in the effect of the ray depends largely on the quantity absorbed. The rays given off by a higher tube are not absorbed so much as those emanating from a low tube and do not produce as early secondary depressing effects. It is not good sense nor good practice to treat a skin lesion with a ray that will penetrate a brick wall.

Dr. Burdick, in explanation, said that he always reduces his therapeutic tubes below the line where any X-ray is given off at all and in that way he knows the exact penetration power of his tubes, and it is within his control by regulating the speed with which we drive the cathode stream. This in turn is controlled by the electro-motive force of the apparatus, which can be raised as desired by increasing the resistance in the circuit. For superficial work he uses one-eighth inch spark gap on either side of the coil; for epitheliomata, one-fourth inch is sufficient. The fluorescent ray is stimulating, but has no photographic power.

The next paper was read by Dr. Chas. L. Leonard of Philadelphia on:

"THE RESULTS OF THE ROENTGEN METHOD IN THE DIAGNOSIS OF RENAL CALCULUS."

The application of the X-ray in the diagnosis of stones in the

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kidney has been attended by marked success. The diagnosis of renal and ureteral calculi can be made with error of less than 3 per cent. In 89 cases a mistake was made in only 9 cases. Sixty per cent of the stones in these cases were found in the ureter. In only one out of the 89 cases did the X-ray show a calculus to be absent when it was found at the operation. If the negative shows a calculus and the operator fails to find it, it does not signify that the X-ray is in error, because in most of these cases subsequent operators have found the calculus. The X-ray is of great value as a means of differential diagnosis between various lesions of the kidney which closely simulate each other. Ureteral calculus may simulate appendicitis or oöphoritis. But the X-ray will not be employed as a routine agent in diagnosis until its use is demanded by the general practitioner. More than half of the calculi found in the kidney do not give rise to symptoms until they reach the pelvis of the ureter. The X-ray used in this connection facilitates operation by giving the size, number and location of the calculi. The surgical shock is lessened; there is less danger of operating on the wrong kidney, and no calculi will be left behind when the skiagraph shows that they are there. Exploratory operations become unnecessary. The operation becomes complete and comprehensive. The treatment of kidney lesions should not be undertaken until the kidney has been rayed.

DISCUSSION.

Dr. James B. Bullitt, Louisville, Ky., said that there are two classes of men who refuse to use this valuable method of diagnosis of kidney disease. One the surgeon who is too busy, as he thinks, to use it, and the other the man who has not been successful with the X-ray work and lays it to the ray or the apparatus. In the hands of good men very small stones of very slight density can be demonstrated. The value of the method is incontrovertible. He cited a case of a kidney so far gone that nephrectomy was done. The pelvis of the kidney was opened and several stones were found. For experimental purposes the kidney was rayed, when, much to his surprise,

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another stone was found high up in a calyx, one which would have been overlooked in a nephrotomy for renal calculus, and another operation would have been necessary later on, thus invalidating the first. Similar cases have been reported by Leonard and by Bevan and others. This method also gives us an opportunity to observe whether or not the stone will be advanced through the proper channel or whether operation is necessary.

Dr. Henry Hulst, Grand Rapids, Mich., cuts out the secondary rays which are apt to create confusing shadows on the plate by compressing the body of the subject. He accomplishes this by means of a compression diaphragm, between which the patient is squeezed. Another method is the inflation of the colon with air. This is especially applicable in the case of a large subject. He measures the penetration of his tubes by the Walter skiameter. For a large subject he uses a tube that will penetrate through six openings; for a small subject five. It is better to use a low tube with a longer exposure than a high tube with a short exposure.

Dr. Leonard stated that his technique is the simplest; that he uses neither diaphragms nor compression apparatus. The patient is placed on the back with the head and hips elevated so as to bring the lumbar region as close to the plate as possible. The tube having a resistance of from one and one-half to two inches parallel spark gap is placed at a distance of 18 inches from the body.

Dr. Clarence E. Skinner of New Haven, Conn., read a paper entitled:

"TWO CASES OF SEVERE X-RAY NECROSIS, PRESENTING SOME UNUSUAL FEATURES."

(See paper on page 433, December issue.)

Dr. Skinner also reported a case of cervical adenitis that had been treated successfully with the X-ray, but in which there appeared a new growth of hair on the side of the neck and face which had been exposed to the ray. The hair, which was quite long, appeared in regions that normally are entirely devoid of hirsute growth.

Dr. Newcomet reported the case of a lady of 80, treated

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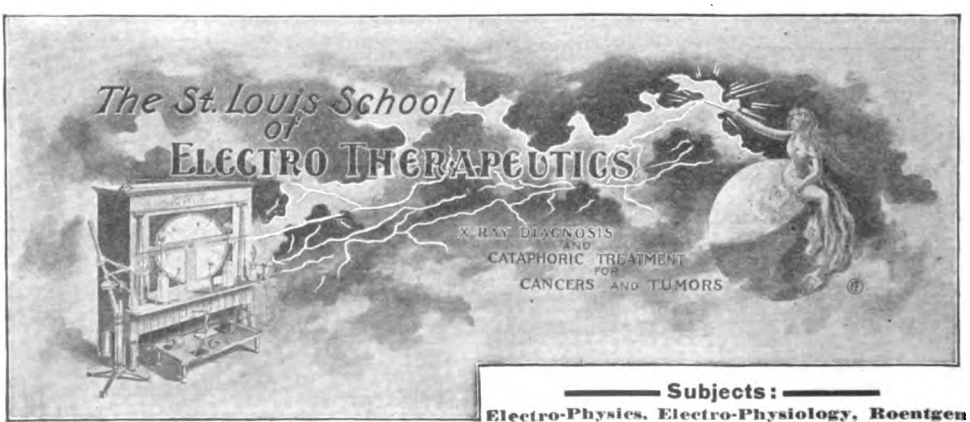
for epithelioma of the forehead, who prior to the X-ray treatment had been quite bald. After some time there was a most profuse growth of hair over her forehead and partly backward from it.

Dr. Pancoast cited a similar instance in which a man developed a heavy beard after X-ray treatments, whereas he had but a very scanty growth before that. Personally his hair on the left side of the head fell out considerably for a time, but now it is heavier than ever.

Dr. G. P. Girdwood said that although quite bald formerly, since he had been using the X-ray his hair had again begun to grow.

Dr. James B. Bullitt, Louisville, Ky., reported a case of necrosis occurring several years after the primary injury had been sustained. A young man engaged in the manufacture of X-ray apparatus burnt the side of his face very severely. It finally healed up, but a year later he developed an abscess on the root of every tooth in his mouth, occasioning him considerable pain and inconvenience. Evidently the nerves had all been destroyed.

Prof. Goodspeed felt that many of these phenomena are due to a secondary action on the walls of the room. Everything in the field of an X-ray tube is secondarily active and sends off rays of some sort which have some of the characteristics of the X-ray, and it is to these rays that these indirect effects must be ascribed.



Subjects:

Electro-Physics, Electro-Physiology, Roentgen Rays, Violet Rays, Electro-Vibration, including all other forms of Physical Therapeutics in Medicine and Surgery.

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Archives of Electrology and Radiology

Vol. IV February, 1904 No. 2

Original Contributions.

CONVENIENT METHODS OF MAKING RADIOGRAPHS.

By Chas. Brush, Radiographer of the Metropolitan Hospital, New York.

Now that radiography has gained such an important place in diagnosis, it behooves every physician to not only become thoroughly acquainted with the use of the fluoroscope for preliminary examinations, but to also learn the art of making radiographs, permanent records which are so valuable for reference, especially in cases in which the progress of a disease must be carefully watched.

The physician must not be content with a general knowledge of the exposure necessary for the different parts of the body or for various sized subjects, depending upon some outsider (generally the local photographer or amateur finisher) to do the rest. He should perform the whole work himself, for it is in this way only that he can correctly interpret what he finds on his plate or print.

Too little attention has been paid to this phase of the subject and many serious mistakes have been made where a diagnosis has been based on a picture showing effects which were the result of faulty manipulation or where changes in the methods of development or changes of operations produced plates or prints widely differing in character from those which the physician has been in the habit of handling before.

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A change in the developing agent may, by yielding a negative of coarser or finer grain, produce the effect of a difference in the fiber of the bone structure; a blister in the gelatine, afterward drying down flat, or the uneven drying of the negative may produce shadows that might indicate diseased tissue, as in a tuberculous case.

If each physician did his own work from start to finish, or at least had it done under his personal direction by an expert radiographer, all of these conditions would be known and a proper allowance made for them.

Many physicians will say: "All of this may be very true, but what am I to do? I know nothing about practical photography, and if I did, the photographic chemicals necessary to use would stain my hands and finger nails so badly that they would not only look very unprofessional, but I would hardly dare to let them be seen by some of my more fastidious patients."

This excuse might have been good a short time ago, but will not answer to-day, for there are now upon the market photographic chemicals that are not only peculiarly adapted for X-ray work, but which have none of the objections cited above, and furthermore can be obtained in such form that the operations become almost mechanical.

A developer which will appeal strongly to the medical profession and to those of the laity who made radiographs is edinol, which has proved so valuable in producing the fine gradations of light and shade necessary in the radiograph negative that the results are simply marvelous. With the formula which I use for developing results are obtained that are a surprise to the operator. Even the tyro developing his first X-ray negative will appreciate the work of edinol, and the expert will find in it a medium through which he can surpass his best previous work.

Gone are the days of chemical fog, of density which made printing a burden, of underexposure and its troublesome remedy and the old mercury or the old uranium intensifiers. "Edinol thinks"—it develops where necessary, and, having

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fulfilled its mission in the highlights, halftones and shadows, stops and awaits the operator's further pleasure.

To the physician who employs the coil in his radiographic work and who is enabled to make "instantaneous" exposures my edinol formula will appeal strongly, while to those who use the static machine to excite the tube possibilities in exposure and development hitherto deemed unattainable will become matters of intense interest. The fear of too much density in overexposures will bcome a thing of the past.

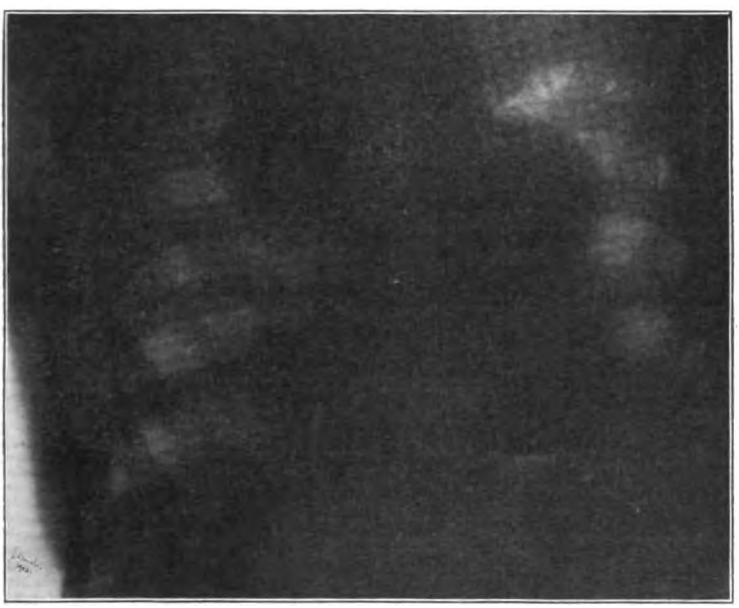


FIG. 1. *The cut is much darker than the photograph.*

A striking illustration of results obtainable may be seen by referring to plate I. The patient, Mr. T., age 40, weight 160 pounds, was exposed to the ray from a No. 7a R. Friedländer adjustable tube, the current being furnished by a 12 plate by 30-inch static machine; the tube medium vacuum, 20 inches distant, exposure 8 minutes.

The negative was developed with the following formula, the ingredients of which were dissolved in the order given:

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Water, 5 ounces; acetonesulphite, 75 grains; sodium sulphite crystals, 1 ounce; edinol, 30 grains; hydroquinone, 15 grains; potassium bromide, 7½ grains; potassium carbonate (dry), 1 ounce.

Dilute with four times the quantity of water. The time of development was less than 8 minutes. The results confirming in part the physical diagnosis, "enlargement of auricle and ventricle," shows also aneurism of aorta, with calcareous deposits in the aorta, a tumor in the mediastinum, the shadow of the vena cava and calcareous deposits therein, dilation of auricle and ventricle and adhesions of the aneurism of the aorta to the chest.

Prints made from radiograph negatives on either bromide or gaslight papers and developed with edinol give beautifully clear details of tissues and reveal with remarkable clearness the articular surfaces of the bones of the shoulder, arm, wrist, thigh, knee and foot—results that repay a thousandfold the change from the use of the developers of yesterday to the edinol of to-day.

Owing to the many complications that sometimes arise when making X-ray exposures, such as the restlessness of the subject, the length of time necessary for exposures of the heavier parts of the body, etc., it is frequently impossible to get a fully timed plate. In such cases I would recommend carrying the development to the utmost with the above formula, which, by the way, has no tendency to fog, and after the plate has been thoroughly fixed and washed, intensifying it with the following:

Intensifier Bayer, 70 grains; water, 4 ounces.

This intensifier requires no after treatment, keeps indefinitely and can be used repeatedly. With it details are obtained which were not visible before the intensification. A marked illustration of this has occurred during the writer's experience. An exposure was made for renal calculi, which could not be detected when the plate was developed. Intensification as above described resulted in bringing the shadows of the calculi to view as finely divided particles. Operation on

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the patient resulted in the removal of half a dozen calculi about the size of a large pinhead, although diagnosis failed to show any presence of calculi whatever.

For fixing purposes I have discarded the old acid hypo-bath. I have used for years and now use the following:

Fixing salt bayer, 4 ounces; water, 16 ounces.

This bath I find superior to anything I have ever tried. The film of the plate does not become tanned nor is any discoloration of the film apparent. Furthermore the bath fixes much

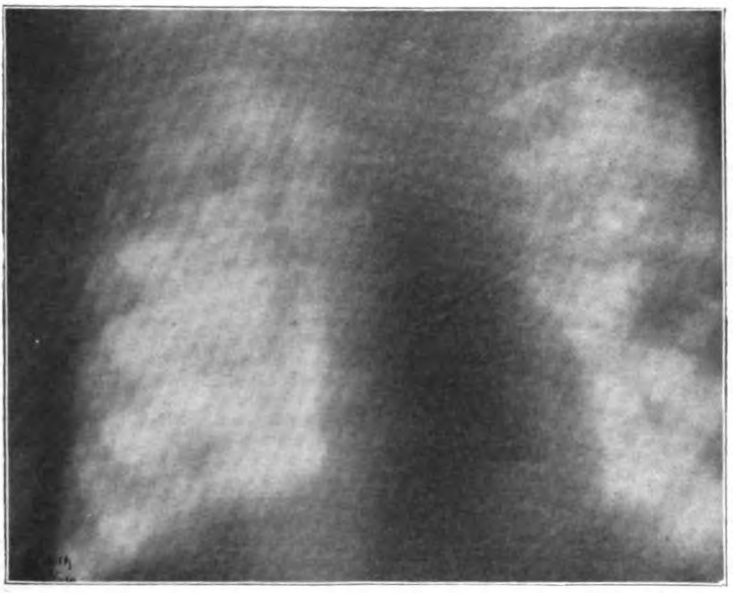


FIG. 2. *Overexposed (30 minutes) developed with Cramer's formula. Consolidations in Tuberculosis.*

more quickly than ordinary hypo and owing to its non-tanning properties it is more easily washed out. Added to these advantages is the fact that the bath remains perfectly clear, even after prolonged use.

The advantages of working by the methods described above as compared with the old formulæ are many,—less time in development, perfect clearness, greater brilliancy, much superior

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printing qualities, freedom from fog or stains and, in fact, infinitely better negatives. In Edinol the radiographer has undoubtedly the most excellent medium for X-ray development ever introduced. In my regular work I have adopted the following rules: For exposure through the chest and pelvis I use the formula given above; for injuries and diseases of the bones or any subject where detail of the bones is essential I employ the following:

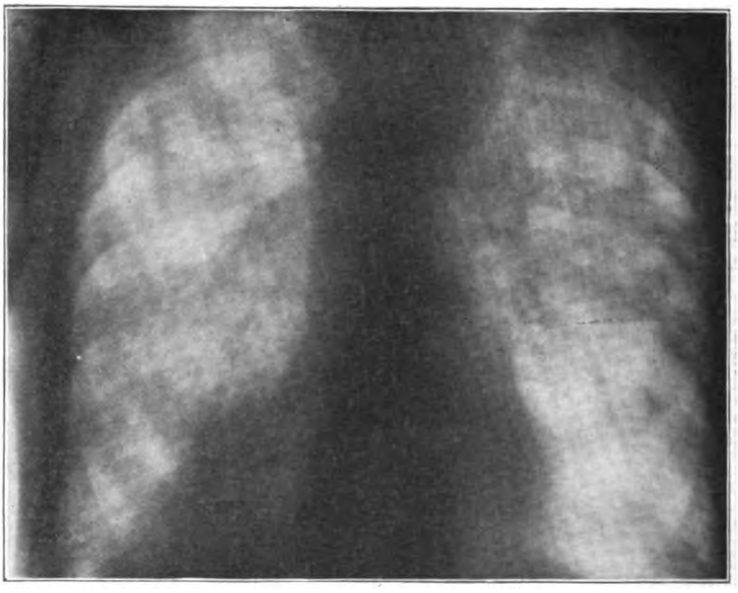


FIG. 3. (*Same exposure as figure 2*) *Developed with Edinol. Consolidation in Tuberculosis.*

Edinol	15	grains
Acetonesulphite	45	"
Sodium Sulphite Crystals	300	"
Potassium Carbonate	150	"
Potassium Bromide	8	"
Water	3½	ounces

Where uncertain exposures have been made, I have adopted the following stand-developer:

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Edinol Concentrated Developer ..... 4 drachms
Water .....48 ounces

In this bath the development takes place in about 30 minutes, and with it, it is possible to obtain the finest details even in extreme underexposures.

As an example of what Edinol is capable of, see plates II and III.

No. II is the result of development with the formula given by the Cramer Plate Co. for their X-ray plates for overexposures and called by them the "contrast developer." No. III, same exposure, was developed with the following:

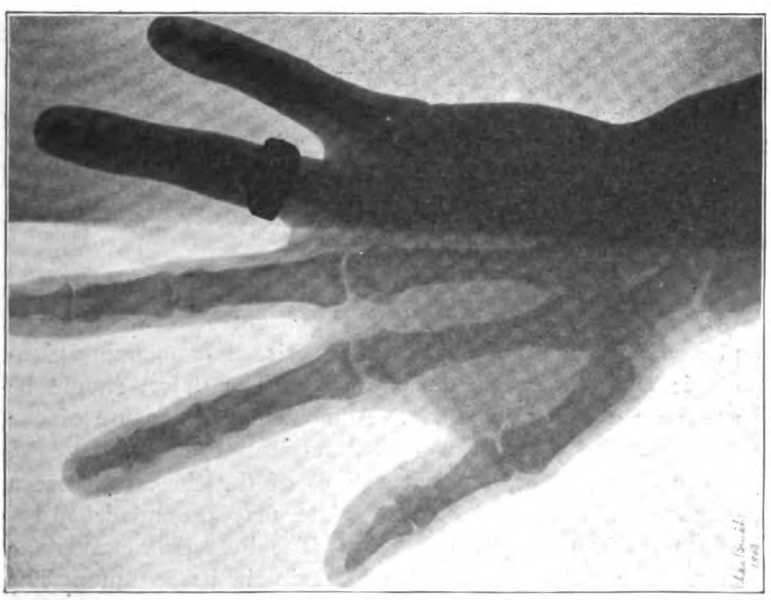


FIG. 4.

Conc. Edinol Developer ..... 1 drachm
Water ..... 3½ ounces
Acetonesulphite .....15 grains

No. IV shows an underexposed picture of a hand one-half treated with the intensifier, the other half remaining just as it

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came out in development. Nothing need be said further, the plates speak for themselves.

The writer has a collection of negatives, developed and treated by the above methods which are uniformly excellent and which have evoked expressions of admiration from many physicians.

The quality of these negatives, I must admit, is not due so much to my skill as to the splendid properties of the chemicals I have used, in fact the veriest tyro can produce equally good results with "Edinol, the developer that thinks."

CHARLES BRUSH,
Metropolitan Hospital, Blackwell's Island, N. Y.

PAPERS READ BEFORE THE AMERICAN ROENTGEN RAY SOCIETY.*

Dr. Henry Hulst, Grand Rapids, Mich., followed with a paper entitled:

"SKIAGRAPHY OF THE CHEST."

Skiagraphy of the chest is a significant and valuable supplementary method of physical diagnosis. For obtaining pathologic detail it is of unusual value. The object should be as nearly at rest as possible. A momentary exposure of one second or less, during suspended respiration, is long enough. When skiagraphing limited portions of the chest wall use a diaphragm. To secure contrast, plate may be sandwiched between calcium tungstate screens. The induction coil is the best. The tube must be able to maintain its vacuum. The lowest tube that will do the work is the best for the purpose. Short exposure eliminates, to a certain extent, clouding. When the chest is at rest we avoid blurring of the lung detail. Time exposures defeat the very purpose of skiagraphy. Always test the tube by means of Walter's skiameter.

*Continued from our January Issue.

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Dr. Mihran A. Kassabian, Philadelphia, read a paper entitled:

"HOW TO OBTAIN AN INSTANTANEOUS SKIAGRAPH OF THE THORAX."

The coil is the most important part of the equipment. It will excite tube more effectively than will the static machine, which is lacking in many things. The coil should be one of twenty inches spark-producing capacity. The next most important part of the apparatus, without which the coil would be useless, is the interrupter. The electrolytic interrupter is the one that gives the best result in skiagraphy of the chest. It gives a rapid make-and-break, having from 8 to 16,000 vibrations per minute. The vibrations of the mechanic interrupter are too slow, and therefore the instrument is useless. A tube having a high degree of vacuum should be used. This means that the power of penetration is also high, a fact that has been proven highly essential in this rapid skiagraphy. The degree of penetrability is best measured by means of the fluorescent screen. Intensifying screens should be used only in those cases where the patient demands a short exposure. The plate must be a highly sensitized one. The author also exhibited a specially constructed table of his invention to be used for taking skiagrams. The patient can be placed in the best possible position without inconvenience, so that good skiagraphs are assured. Attached to the table and forming a part of it is an adjustable plate holder and diaphragm. In order to secure the best possible results from X-ray work Kassabian advised the use of a record blank that gives not only the usual information as to findings and diagnosis, but also, and more particularly, the exact technique that was used. In this way alone will our work be of profit to others, as well as to ourselves. He exhibited a blank that he uses for this purpose.

DISCUSSION.

The discussion on these two papers was opened by Dr. Gordon G. Burdick, Chicago. He said that better results are obtained from prolonged exposures rather than from the short

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ones. Much of the success of this instantaneous skiagraphy is dependent not on the X-light, but on the developer used. It is surprising that Dr. Hulst has been so successful in the use of hydrochinon, because it is the slowest of them all. Furthermore, it intensifies the high lights at the expense of the middle tones. Amidol, rodinol and metol are the best developers for this work. They act very quickly, but when printing after using amidol we must add something that will impart a little bit yellow in order to give a good print. Hydrochinon is the most contrasty, as well as the most contrary and the slowest developer we have in photography.

Dr. Kennon Dunham, Cincinnati, Ohio, called attention to the fact that Dr. Hulst recommended the use of a low tube, whereas Dr. Kassabian uses a high tube. He asked to have these terms explained.

Dr. Preston M. Hickey, Detroit, Mich., gave it as his opinion that we do not yet know how to interpret all the shadows in a plate correctly. The bulk of the shadows seen in these skiagrams of the chest are made by the blood vessels and bronchi. He proved this by injecting the vessels with a mass and the bronchi with fine shot. This differentiation is important because the worker might mistake these shadows for consolidations and thus give a wrong diagnosis.

Mr. H. Snowdon Ward, London, England, spoke on the sensitiveness of plates and the methods for determining this point.

Dr. Hulst, in closing, said that any good developer with an ordinary plate will do the work. Dr. Burdick lays too much stress on the developer. It is the manner in which the work is done that is important. This applies to both the apparatus and the developer and plate. To determine the penetrating power of a tube the skiameter must be used. That alone is definite.

He uses the following developer and fixer:

Developer: Sol. A.—Metol, 30 grains; hydrochinon, 30 grains; sod. sulph. (dry), 130 grains; water, 16 ounces.

Sol. B.—Pot. brom., 15 grains; sod. carb., 130 grains; water, 16 ounces.

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Use equal parts for ordinary negatives; if negative is over-exposed, dilute mixture one-half with water.

Fixer: Sol. A.—Hypo, 2 ounces; sod. sulph. (crystals), 4 ounces; water, 96 ounces.

Sol. B.—Chromalum, 2 ounces; ac. sulph., ¼ ounce; water, 2 ounces.

Pour B into A, stirring rapidly all the time.

Dr. Kassabian, in closing, said that the voltage and amperage of the coil used, how many sparks in the secondary coil, the distance of the tube, etc., have a great deal to do with doing good work. The photographic plates are not so good for this work as are the skiagraphic plates.

"LOCALIZATION OF FOREIGN BODIES BY THE ROENTGEN RAY," contributed by Dr. Wm. E. Sweet of Philadelphia. The author presented two pieces of apparatus to be used in the carrying out of his work. The principle of his method consists in taking two skiagrams at definite but unequal angles and by means of figures on the apparatus and a little calculation he succeeds in locating the body. One apparatus is intended for locating foreign bodies in the eye, the other for locating foreign bodies in any part of the body.

The next paper, entitled:

"CARE OF THE STATIC MACHINE,"

was read by Dr. Henry E. Waite of New York city. He laid great stress on the necessity of keeping clean the static machine in order to have it always in working order and to get the maximum result. The worst source of trouble is the accumulation in the machine of vapor. The outside humidity does not affect the working of the machine if the inside of the case is perfectly dry. The machine can be kept dry if it is built air-tight or by frequent cleaning. The author places inside of the case two or three jars containing a mixture of two parts of chopped ice and one part of rock salt. This condenses the vapor sufficiently so that it can be absorbed by baked calcium chloride, which is placed in the machine after all the vapor has been condensed. The machine will then charge without

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difficulty. Oftentimes the failure of a machine to do its work well is directly due to the vapor inside of the case. It is essential that all the parts of the machine, inside and outside, be kept clean. The plates are cleaned with kerosene oil and are then rubbed down with vaseline, which removes all the dirt. All the buttons and sectors are cleansed in the same manner. The brushes are first boiled in a caustic solution, then in hot water and thoroughly dried before they are replaced. The glass legs of the platform must not be overlooked. Before placing the calcium chloride into the case it must be baked thoroughly so as to evaporate all the moisture that it may contain. The inside of the case may also be dried by placing in it a lighted Bunsen burner, but care must be taken not to let it smoke. The plates are allowed to revolve slowly in the meantime. In those seasons of the year when the atmosphere is cold and dry it is advisable to take out both doors and allow the circles to revolve slowly for half an hour.

DISCUSSION.

Dr. W. W. Johnson of Rochester said that he has a Wimshurst machine which he has been working steadily for several years and it had to be dried out only once. He finds the preliminary condensation of the vapor by means of cold unnecessary and time-consuming. He bakes the calcium chloride, stirring it all the time, until it is of the consistency of maple sugar. It has then attained the maximum porosity, a very necessary feature if it is to be an efficient dryer. It dries out the machine in fifteen minutes. When it is saturated the mass will fissure. Or when the machine changes polarity during the day, then the case contains moisture.

Although the static machine cannot do this rapid radiographic work, yet it is admirable for treatment. The static machine wants a very light tube, a smaller tube. He uses a Monell tube, a plain tube, not a reducing tube. When the tube gets too high bake it from ten to fifteen minutes.

Dr. John C. Pitkin, Buffalo, N. Y., uses half a bushel of quick lime that he puts into a separate chamber under the

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machine to dry out the case. A number of holes provide for proper ventilation.

Dr. Wetherell of Philadelphia places a piece of paper moistened with a solution of chloride of cobalt in his machine to indicate the presence of moisture.

Dr. G. G. Burdick of Chicago discouraged the use of chemical dryers in a machine, with the exception of calcium chloride prepared in the manner indicated by Dr. Johnson. One of the most efficient hygrometers is an ordinary ginger cooky. This is placed in the case and when it can be bent without breaking it, it is an indication that the case contains vapor. The Wimshurst machines are not susceptible to moisture short of deluging them with water. Another method is to pump out all the air from the case with an electric pump. Then pass in a fresh supply, passing this through calcium chloride and mineral wool filter so that the air is free from moisture and dust. If a machine stands in direct relation with the magnetic lines of the earth you will have trouble with it. A machine that has stood east and west or across the magnetic lines of force of the earth will not trouble you much. If located over some body of iron or where something is developing the magnetic lines of force the machine is apt to change its polarity very often.

Dr. G. P. Girdwood and Dr. Johnson, Pittsburg, cited instances where carbide of calcium was used instead of calcium chloride and sounded a note of warning to be careful to get the proper salt.

On the evening of the first day the president, Prof. Arthur W. Goodspeed, Philadelphia, delivered his presidential address. He chose for his subject

"THE TREND OF MODERN THOUGHT UPON THE SUBATOMIC STRUCTURE OF MATTER."

This paper was a very scientific discussion from the standpoint of the physicist of the latest theories in connection with the subject indicated by the title of the paper.

The first paper of the second day of the meeting was read by Dr. Preston M. Hickey, Detroit, Mich., entitled:

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"THE DEVELOPMENT OF THE SKELETON—RADIOGRAPHICALLY CONSIDERED."

He arrived at the following conclusions: (1) The radiograph affords a simple method of studying the formation of the bones of the body. (2) It affords to the anatomist a means of studying the epiphyses of the bones. (3) The statements in the text-books on anatomy regarding the formation of bones and joints should be revised according to the knowledge gained by the radiograph. (4) Reproductions of radiographs of fetuses at different ages should be inserted in our text-books on anatomy in order to elucidate what is now somewhat neglected and imperfectly understood. (5) Radiographs for diagnostic purposes, especially of injured joints, should always be compared with the radiograph of a normal joint. The author exhibited a number of lantern slides illustrating the ossification of every bone in the body of the fetus and indicating the time when each ossification occurs. He showed also when the epiphyses of the bones were united to the shaft and pointed out the possibility of overlooking a fracture in or near a joint if epiphyses has not united with the bone.

DISCUSSION.

Dr. G. P. Girdwood, Montreal, Canada, said that in cases of diseased bone these radiographs of normal children are extremely useful. Furthermore, this work is invaluable from a medico-legal standpoint; by means of these radiographs it is possible to determine the age of a fetus or a child that may have been posthumous, a matter of considerable importance where family honor or titles are concerned. He also exhibited a number of lantern slides illustrating deformities of the skeleton.

Dr. J. B. Bullitt dwelt on the importance of having a complete radiographic history of the growing skeleton for diagnostic purposes in cases of fracture near the epiphyses.

"THE EFFECTS OF RAYS ON LOWER ANIMAL LIFE,"

read by Dr. Kennon Dunham, Cincinnati, Ohio. This paper detailed in full a number of very interesting and carefully performed experiments by means of which the author endeavored to determine the effect of the ray on tissue. He concludes that

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the closer the tube to the object the more destructive the ray. Low tubes excited by small currents are not so destructive as low tubes excited by heavier currents which are resistant. Very high tubes have very little effect. The destruction of tissue is due to the X-ray and not to the cathode ray, as is claimed by some.

DISCUSSION.

Dr. Wm. H. Dieffenbach of New York city detailed briefly the experiments conducted by a German scientist with reference to the effect of the ray on the procreative power of rabbits. The sexual power of the rabbits exposed to the ray for some time was lost entirely. The spermatozoa found in the testes and seminal vesicles of these animals were inert.

Dr. Henry E. Waite of New York city criticised the indiscriminate use of the words high and low tube, or hard and soft tube. These terms are devoid of any meaning having reference only to the amount of gas in the tube. It is the penetration we want. A good tube is one having a well-balanced vacuum and a perfect focus..

Dr. Weston A. Price of Cleveland, Ohio, followed with a paper on:

"TECHNIQUE FOR MAKING GOOD DENTAL SKIAGRAPHS."

The two essentials are high penetration and a large volume; the former to secure contrast between dense substances like bone, tooth substance and root fillings, and the latter to secure good definition with such short exposures as are necessary in dental skiagraphy. This requires a very powerful generator and a good interrupter. He uses a large coil and the Wehnelt interrupter. A tube is required that will make quite transparent and white the bones of the hand. For locating abscesses use a tube having lower penetration than is used for locating root fillings. He uses a specially constructed film made of a very smooth, flexible and transparent celluloid. This is covered with a waterproof and light-proof flexible container (unvulcanized black dental rubber calendered thin). Next to the film he places bromide; it protects the film and always helps to give a good positive. The film cannot be scratched, bent or broken.

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DISCUSSION.

Opened by Dr. L. E. Custer, Dayton, Ohio, he agrees with the author in the matter of using a large coil, but takes exception to the Wehnelt interrupter, because all electrolytic action is accompanied by heat, and when the concentration of current is sufficient at the metallic point of the Wehnelt interrupter an insulating vapor surrounds the point which causes the action to cease for the time being. The principle is the same in the Caldwell interrupter, but the manner in which it takes place is not the same. My modification consists of a porcelain cup having an inside capacity of two by six inches. Near the bottom is a hole at an angle of forty-five degrees. The cup is poised in such a manner that it can be tilted so as to have the hole either horizontal or perpendicular. The volume of current is in direct proportion to the size of the opening, and the frequency of interruption is proportionate to the period of time that each bubble of gas is displaced and the circuit is again established. When the canal is horizontal it takes more time for the displacement to occur than when it is perpendicular. The thickness of the wall and the depth of the solution also modify the frequency of the interruptions. A filed rheostat in series with the primary also is an efficient interrupter.

A medium tube is best because too high penetration destroys the contrast. It should have a fixed vacuum, such as the Mueller and Gundelach tubes. The target should be heavy and the exposure should be made as quickly as possible so as to get all the microscopic detail. With reference to the film, he places two films face to face and then wraps them up in two separate coverings of black waterproof paper. This protects the films and gives us two films, which may be developed differently. The film should be held parallel to the teeth and the tube perpendicular thereto.

Drs. M. H. Cryer, Pancoast, Goodspeed, Cook, Leonard and Kassabian showed lantern slides of abnormalities of the teeth. Dr. Kassabian puts the plate on the outside of the jaw and places a two-inch block of wood between the patient's teeth so

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that the rays can be sent in between. The direction of the ray is regulated according to the teeth to be skiagraphed. The time of exposure is a little longer than with the other method, but it has the advantage of showing the relation of the other teeth.

Replying to a statement made by Dr. Cryer that it is unfortunate that we cannot locate the roots of impacted teeth with respect to their direction, Dr. Price, in closing the discussion, said that he always took two skiagraphs from different angles, and by placing them in the stereoscope it is a very simple matter to locate either the tooth or the direction of its roots.

"DEVELOPERS,"

by Dr. Gordon G. Burdick of Chicago. After a careful study of the most used developers he arrives at the conclusion that no one single developer answers the purpose; that by making a combination developer, submerging the bad qualities and bringing out the good qualities of each developer he has been able to obtain a developer that has given him uniformly satisfactory results. This is the formula:

Sol. A.—Potassium metabisulphite, 8 grams; metol and ortol, each, 15 grams; potassium bromide, 1 gram; distilled water, 1,000 grams.

Sol. B.—Sodium sulphite (dry), 40 per cent; sodium carbonate (dry), 60 per cent; in water, 1,000 grams.

Use 30 c. c. of each and dilute with water according to the effect desired. The less water is used the greater the contrast; the greater the dilution the softer the negative and the greater the detail.

The ortol imparts a brown color which gives the greatest possible contrast; will not fog, no matter how long the plate is left in the solution. The metol brings in a wealth of detail and does not show any disposition to fog. The sodium sulphite imparts a black stain to the silver molecules. The metabisulphite of potassium preserves the developer and prevents the action of the oxygen in the air on the solution. The sodium carbonate is not required and usually is harmful; its

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function is to save time. If used in too great strength there is a loss of the sharpness of the lines; the gelatin becomes soft, changes its position on the plate and all relation is lost. This developer is not suited for instantaneous work. For this amidol is the most suitable. It is very rapid, more so than any other developer, and gives a very transparent negative, but good positives cannot be obtained without the use of an intensifier.

DISCUSSION.

Dr. Mihran A. Kassabian, Philadelphia, said that most of the trouble arising from the developer is due to the fact that operators do not use any one developer long enough to become thoroughly familiar with it. If you learn to know your developer thoroughly you can modify it to suit the particular case. We must consider also the time of exposure, the thing exposed, what is wanted, the plate used, etc., in order to have good negatives. By developing slowly we get contrast; intensifying with bichloride of mercury gives detail. He keeps all his solutions in separate bottles so that he can use of each as much as may be required. In that way the work can be done with exactness and the result is better. Too much alkali is liable to veil and fog the plate. Use weak developer first and then work up as indicated. The solutions should be kept cold. Metol is superior to the pyro, but it is very irritating and cannot be used by an operator suffering from an X-ray burn. If we want a soft yellow print, as in hip cases, then the hypo gives the best results.

Dr. Wm. H. Dieffenbach, New York city, prefers edinol, a salt of metol. It brings out very good detail in cases of fracture, tuberculosis of bone and aneurysms and other lesions of the blood vessels.

Dr. J. P. Hetherington and Prof. Goodspeed stated that they had tried all kinds of developers, and that as they got through with one they threw it into a jar until finally they had a heterogenous mixture. Whenever they wanted to get a particularly good plate they would use this mixture, and always with excellent results. It may have been due to a

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combination, as was suggested by the author, a submerging and intensifying process.

RECURRENT CARCINOMA OF THE BREAST TREATED WITH THE X-RAY.

Dr. W. F. Campbell presented a patient before the Brooklyn Surgical Society, who had come to him twenty months ago with well marked carcinoma of the breast. The tumor was noticed about three months before and there were some enlarged glands along the border of the pectoralis major and in the axilla. He performed a Halstead operation and the wound healed without incident. A year afterwards there was a return of the carcinoma along the scar and an infiltration of the glands in the supra clavicular space, about the size of an orange. He removed the nodules in the scar and subjected her to X-ray. Treatment was given for about eight months, the tumor being reduced to about one-third. During the treatments the skin had become bronzed but no deep burn had developed although the treatments had been given three times a week for eight months. There was marked relief from pain.

The doctor did not claim that the case would progress to a cure, but felt that the relief offered, justified the treatment.—Brooklyn Journal.

THE ACTION OF RADIUM ON BACTERIA.

H. W. Dickson and J. T. Wigham of Trinity College, Dublin, carried on this investigation. They used 5 milligrams of radium bromide and exposed for 4 days at a distance of 4.5 millimeters to the beta rays agar cultures of bacilluspyocyaneus, b. typhosus, b. prodigiosus and b. anthracis. They found that these cultures were not killed, but their growth was arrested by the rays. A patch inoculated with these organisms remains sterile on exposure to the ray. (Abstract from Nature.)

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Editorial.

"There is a tide in the affairs of men which, taken at the flood, flows on to fortune." There is a time in the evolution of a science when adequate dissemination of accumulated facts leads up to the discovery of great truths, the practical application of which may be productive of incalculable benefit to humanity. We believe that such a period has been reached in the development of electricity and radiant energy as therapeutic agents. For nearly one hundred and fifty years electricity has been struggling to gain a foothold in this field against overwhelming odds of various sorts; and the fact that it has survived in spite of its unfavorable environment is a proof that it possesses very positive value as a therapeutic agent. Radiant energy made its debut in the form of the Finsen light, which was soon followed by the X-Ray, and now radium is demanding an opportunity to fulfill its promises. The advent of the X-ray has done more to establish electrotherapy upon a substantial basis in the professional mind than anything else, and it can hardly be questioned now that all of these remedial measures have come to stay.

The immense amount of investigation that is taking place along these lines at the present time finds expression in a rapidly increasing literature, and it is from this literature that the grains of wheat must be garnered that will finally determine the exact value which these agents are capable of exhibiting in the management of disease. A well-conducted, thoroughly comprehensive journal is a most valuable element in solving the equations which come up in this field. The management of this journel has appreciated this fact for some time past, and the determination which it has always entertained to keep its readers thoroughly informed upon matters pertaining to electrotherapy and radiotherapy has resulted in an elaboration of the scope of the journal and the editorial staff

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connected therewith, to meet these increased demands, and which will place it in the first rank of periodicals covering this field.

To indicate the increased scope the name has been changed to "Archives of Electrology and Radiology," and the first issue under the new regime will take place in March, 1904, the coming number.

The editorial staff will be constituted as follows:

Dr. C. E. Skinner of New Haven, Conn., whose contributions to the X-ray treatment of cancer, especially of the deeply-located forms, are well known to the profession of this country and Europe.

Dr. H. G. Piffard of New York, emeritus professor of dermatology at the University of New York, inventor of the Piffard hyperstatic transformer, the Piffard-Gorhl spark lamp and the Piffard low tension arc hand-lamp for the production of ultra-violet rays, and whose contributions to electro- and radio-therapy in diseases of the skin have gained for him an international reputation.

Dr. Arthur W. Goodspeed of Philadelphia, professor of physics at the University of Pennsylvania, is well known as a physicist in this country and abroad.

Dr. Wendell C. Phillips of New York, professor of otology at the New York Postgraduate Medical School and Hospital.

Dr. Weston A. Price of Cleveland, O., professor of applied electricity in the dental department of the Western Reserve University, and a pioneer in dental radiotherapy and radiography.

Dr. Franklin Martin of Chicago, professor of gynæcology at the Chicago Postgraduate Medical School.

Dr. Robert Heyburn of Washington, D. C., dean of the medical department of Howard University.

Dr. Milton Franklin of New York.

Dr. Adolph Decker of Chicago.

Dr. Russell H. Boggs of Pittsburg, Penn., radiographer to the Allegheny General Hospital.

Mr. Charles H. Treadwell of Chicago, who has performed

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the functions of managing editor so efficiently in the past, will continue with us in that capacity.

The personnel of this editorial combination is a guarantee of the quality of the work which we shall present to our readers in the future issues of this journel, and when we state that we have also increased our list of contributors by the addition of some of the most aggressive and well-known original workers in the field covered by this journal, we feel justified in saying that the product will be unsurpassed in excellence.



ON THE RELATION OF THE APPLICATION OF THE ROENTGEN RAYS TO INTERNAL MEDICINE.

BY J. RUDIS-JICINSKY, A. M., M. D., M. E., CEDAR RAPIDS, IA.

I do remember distinctly, when in 1896 I received the first small Crooks' tube from Germany, and tried to make a skiagraph of my own hand—with my primitive Rumkorff's coil. Certainly I made out the shadows of the bones, but it at once struck me, why not try by diligent work, experiment and research, to see a little more in the shadows of the soft tissues, and differentiate the same in ratio to their density, if possible, so that the application of the Roentgen rays could be made valuable as an accessory to other methods in diagnosis, not only to surgery, but internal medicine also. And through my individual efforts during the following two years I had the opportunity to report my first twenty cases of tuberculosis pulmonalis in incipient stages diagnosed by the X-ray, showing with perfect skiagraphs of the most minute lesions and isolated foci of infection, the possibilities the future had in store for us in examining the thorax, with all the demonstration of changes in outline of the heart, diaphragm and aorta, as well as in substance of the lungs, mediastina and pleura. I soon found out that good results in X-ray examinations as to the internal organs can be obtained and photographed success-

Read before the Iowa Medical Union, December, 1903.

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fully, especially in children, and hope that the X-ray will some day render to medicine services not less conspicuous, and valuable in accurate and absolutely correct diagnosis than those already conferred upon surgery by instantaneous exposures of powerful apparatus with all our knowledge of illumination and posing. It should be borne in mind that skiagraphy and fluoroscopy is an art that requires patient study, special education of the eye to read and differentiate the obtained shadows, experience and practice with all the knowledge of proper technique, physics, anatomy and pathology.

Every quack may buy an apparatus and give you an extravagant statement of findings, which are not true and impossible, and let us state right here, that exactly such and similar people, like the priest in South Dakota, who can tell you at the first look through the fluoroscope "how many bacilli tuberculosis are crawling over each lobe of your lungs," etc., have done more harm than good with all the optimistic writers and few enthusiasts who have with their imagination exaggerated the possibilities and the potency of the X-rays, thereby leading the profession and the public to expect at the present the impossible.

In the application of the Roentgen rays to internal medicine, we find up to the present time that most satisfactory results are obtained in examinations of the thorax, although in some cases useful information may be received in certain lesions in the abdomen and the head on fluoroscopic examination, or with the help of a sensitive plate, tungstate of calcium screen, or both. For comparation we must keep constantly in mind the normal conditions and use the fluorescent screen, which if we wish, may be framed and covered with one plate of "ground glass" to enable us to make permanent records of our findings in each individual case with a pencil in hand.

In examining the lungs which are apparent to the rays, if normal, we find that they do not occupy fully the thoracic space, but that the costal and visceral layers of the pleura make up a sack in which the lungs are let in, so to say, and

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are not always in stretched condition, as the physiologists told us. Any haziness, shadows in the lungs, on X-ray examination must be observed carefully and with the impaired movement of the diaphragm on the affected side lead us to proper diagnosis. Certainly we have to discriminate shadows of the muscles of the chest, neck, shoulder, the clavicle and the ribs, and not consider the circumscribed shadows due sometimes to pulmonary atelactasis—Abrams. Our subject has to be instructed to make forced inspiration during the examination with the hands over the head, the fluoroscope being right against the bare chest anteriorly first, lateral and posterially in different postures of the patient, the shadow of the clavicle serving as a guide in comparation. The shadow of the possible lesion to be observed well has to be in the middle of the X-ray field, or directly under the best rays coming from the anode at a right angle, the position of the subject being such that the penetration is sufficient at the point desired.

The greatest possible value of the X-rays we will find without a doubt in the diagnosis of tuberculosis pulmonalis in an early stage, when it could not be detected by ordinary means. The early recognition, which gives promise of better and successful treatment, depends on the presence of different shadows of the lungs on the screen, and is a sign equally as tardy as the recognition of tubercle bacilli in the sputum. Another fact is that the rays in many cases show the disease to be more extensive than had been mapped out by usual examination, the localization of the diseased areas may accurately be studied, the impairment of the respiratory movement with the lessened movement of the diaphragm on the affected side, both in ordinary and forced respiration, plainly seen, with voluminous and emphysematous lungs coupled with a small heart, characterizing phthisis, with all the progress of the disease, the causes of the dyspnœa, or displacement of the heart. We may diagnose the abscess in the lungs, observe their asthmatic condition with empyema, note the pleurisy with effusion, differentiate simple bronchitis from broncho-

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pneumonia, or croupous pneumonia, and make out with all other methods of diagnosis combined pneumothorax, pneumo-hydrothorax and pneumo-pyothorax, subphrenic abscess with tumors, and thoracic aneurysm, which are at times detected by the rays when their presence could not be demonstrated by percussion and auscultation. In this respect the rays are of great importance, but to depend on the rays alone for complete diagnosis would be an error and a blunder, which would produce many tuberculophobiacs, in about 50 per cent of the cases examined, or aneurysms, which may be simple aortic shadows pulsating and due to temporary insufficiency. Large aneurysm may throw a shadow on both sides of the sternum, but if the sack is too thick, or contains clots, the pulsation will not be plain.

The X-ray shadow of the heart and the great vessels offer six factors for interpretation, the reflex, the visibility, position within the chest, the size, the form and the movements In cardiac hyperthrophy the visibility is increased, same in dilation, and pericardial effusion, in this chest-walls, deep inspirations, and in emphysema, the size and density are also increased in these conditions and the shape of the heart altered with the decreased density in the lungs. There is no better and more precise means of measuring and recording the size and the form of the heart than the application of the rays.

The displacement of the heart will be seen downward with enlarged left ventricle. Pericardial effusion, hypertrophies and dilation of the heart are readily examined, same with congenital transposition, and calcarious deposits at the valves, atherematous patches in the aorta. We may study and observe on the screen the action of digitalis on the heart-muscle from time to time during the treatment of aortic and mitral insufficiencies and other pathological conditions and determine disease of many important structures like the trachea, bronchi, œsophagus, and see there enlarged glands, especially in children, when the lesions which cast the shadow upon the screen are nearer to the same, or right against the sensitive plate, if a picture is taken.

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The other day we succeeded in making an especially good skiagraph of simple degeneration of the brain due to pressure of a fragment of the injured occipital bone. The depression being plain leads us to a white band of the more transparent brain tissue, degenerated, and with a tumor at the base of the brain, the diagnosis being verified later on post-mortem. See the illustration. **Fig. 1.**

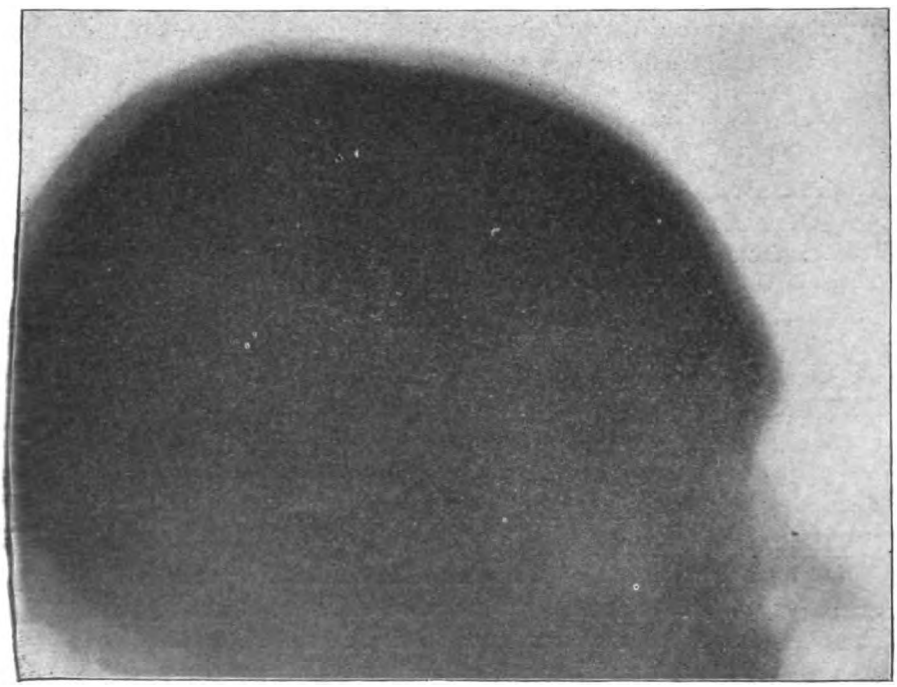


FIG. 1.

In another case of paralysis of the arm, diagnosed as hemorrhage in the cervical region of the spinal cord, due to injury, we made out a simple fissure fracture of the last cervical vertebra with the following hemorrhage between the membranes of the cord. The skiagraph shows the line of fracture, at the point marked, same with the cloth. **See fig. 2.**

The rays have not hitherto achieved much in the stomach, but we have skiagraphed one case of carcinoma of the stom-

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ach, ascertaining its exact whereabouts. An exploratory incision was allowed and the diagnosis of the family physician completed. All those skiagraphs were made with the static

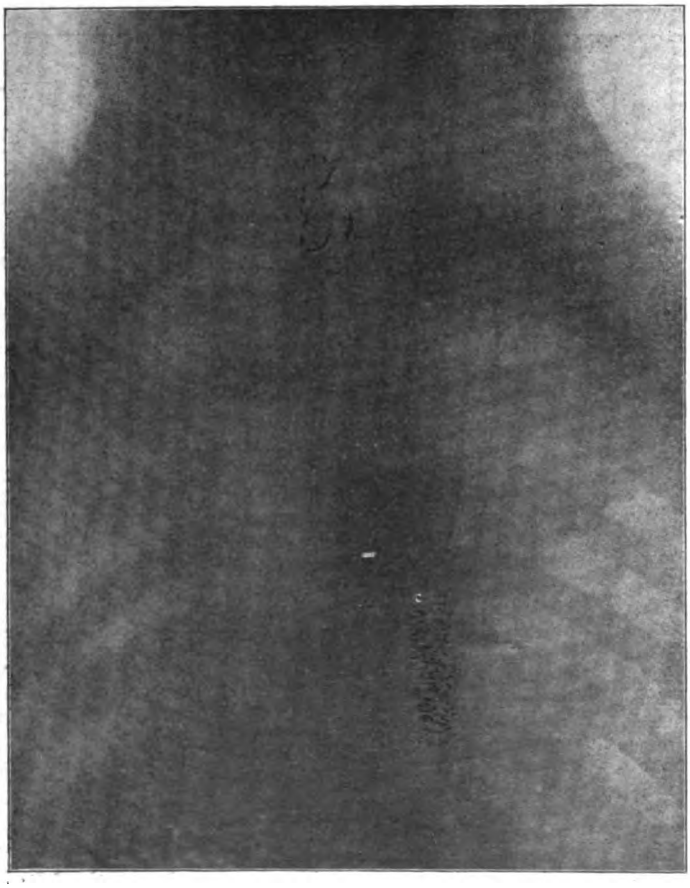


FIG. 2.

machine, large German tube, at the distance of the lesion from the tube of about 12-14 inches, with exposures of five seconds from the moment, counting when the anodal disk in the tube was red-hot, and the tube at its best. The lesion in every case was placed in about the middle of the X-ray field,

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directly under the anodal disk, the rays coming at a right angle, the tube being in such a position to secure the best illumination in straight line from the middle of the disk. Cramers' plates used, with Pyro as the developer.

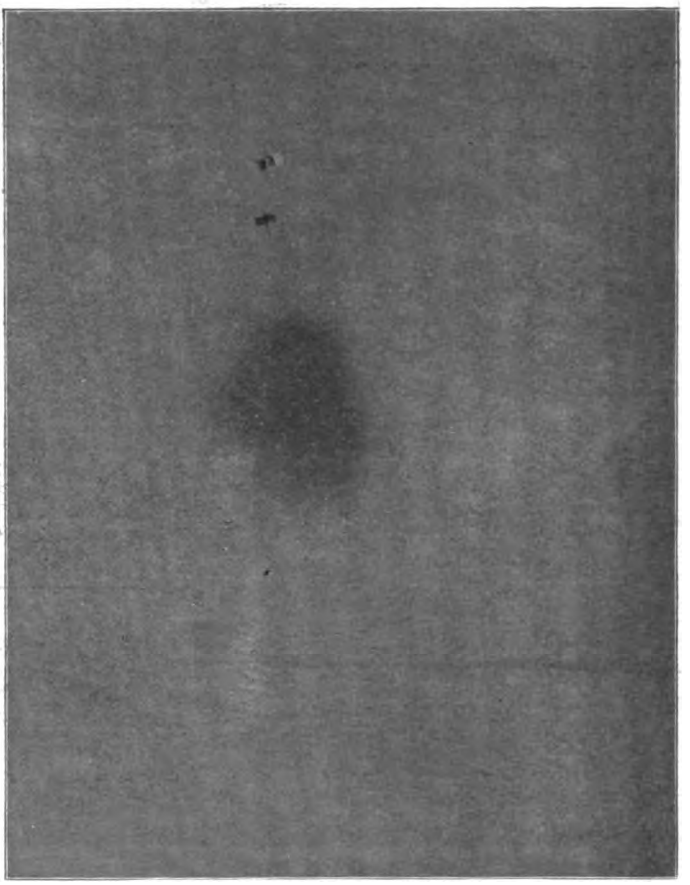


FIG 3. *Carcinoma of the stomach, the two small spots are due to defects in the plate*

The application of the Roentgen rays to the adult abdomen has hitherto yielded results not very satisfactory, but the upper border of the liver with a hytatid tumor may be seen, gall-stones photographed in nearly every case when of phosphatic

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formation. The kidneys may be skiagraphed if simply congested, or containing renal calculus, with all the most minute urethral and vesical calculi, but the negative result will not be a proof in every case that there is an absence of the stones, and on the other hand a slight shadow in the region of the kidneys, or the gall-bladder, is a sufficient evidence what could, or should not be done; the same holds with a shadow in the ureter, which has to be studied in regard to its position, size and form. The same can be obtained in lesions of the pancreas. The stomach containing gas or specially prepared with bismuth will show in outline, and if dilated may be photographed with Turcks' gyromele in situ. Intestinal obstruction is made out with a special harmless capsule, which the patient swallows, with the view to show the seat and the character of the obstruction, according to the shadow thrown on the screen. In children, if bismuth is given in abundance before the examination, we may study the peristalsis of the intestines and photograph those and obtain other findings on short exposures with or without the intensifying screen, or observe the individual digestive steps in the stomach with the peculiar rhythm of the same and of the intestines.

The detection of diseases of the meninges, and any changes with thickening there, congestion, hæmatoma and some tumors may be studied now a little better on fluoroscopic examination, or if we wish to have a permanent record of the status present, it is well to employ an intensifying screen of tungstate of calcium right against the film of the photographic plate, and make a very short exposure to get all the details in the bones, with the shadows of the meninges. The degenerative processes in the brain give peculiar and very marked transparency. This specialty may lead us to a better study of apparent melancholia, hysteria and insanity as to the lesion itself and the true prognosis, and may become an important branch of skiagraphy. Under present methods, however, the results are still more or less uncertain. The picture of ours will not always be beautiful, and the brain by no means so clearly mapped out by the rays, but, nevertheless, on careful study,

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may contain several valuable indications, and vice versa, the most beautiful picture with all the detail possible, can not be reproduced perhaps with the same tube, and under the exactly same conditions, following the rules of the same technique with the slightest deviation.

Our aim has been to deal with the present practical scope of the X-rays in diagnosis in internal medicine. An attempt has been made to treat the matter up to date, and to point out limitations, possibilities and results of experiments, as well as to record actual achievements of our own, with all the hope that in the near future we will be able to offer still more, when the new branch of absolutely correct diagnosis will have the entire support and unanimous endorsement by all thorough, practical and observing practitioners who have given it a fair trial and a more universal commendation.

ADJUVANTS TO THE X-RAY IN THE TREATMENT OF MALIGNANT GROWTHS.

Dr. William B. Coley has given the following as his experience in the combined use of the toxins of bacillus prodigiosus and of erysipelas. The abstract is taken from a paper n the N. Y. Medical Record.

The Relative Merits of the Toxins and X-Rays in Inoperable Sarcoma.—The time has been too short and experience too limited up to the present to definitely decide this question. It is fair to say, however, that in several cases of inoperable round-celled sarcoma in which the toxins had been tried and failed, the X-Ray caused entire disappearance of the tumors. Yet, all of these cases are of recent date, yet in all there has been a speedy recurrence.

On the other hand, in a much larger number of cases of inoperable sarcoma, the tumors have entirely disappeared under the toxins and remained well from three to ten years after treatment. I have had twenty patients with inoperable sar-

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coma remain well from two to ten years after the disappearance of the tumor under the mixed toxin treatment. Of these, fifteen patients were well from five to ten years.

I had the opportunity of observing the effect of the X-Ray upon only three cases of spindle-celled sarcoma, and found it to be exceedingly slight in all. Yet, it is just in this class of cases—the spindle-celled—that the result of the toxin treatment has been by far the most satisfactory, nearly 50 per cent of the cases of inoperable, spindle-celled sarcoma having disappeared under the treatment in my own experience. In the round-celled variety, however, upon which the influence of the toxins is much less pronounced, the immediate results from the X-Ray treatment seem to have been the best. In one of my cases, a very large inoperable round-celled sarcoma, two-thirds of the growth had disappeared under the toxin treatment, and at this point the X-Ray was used in addition to the toxins with the result that the entire tumor disappeared three months later.

In deep-seated and inaccessible growths the results from the toxins will probably prove better than from the X-Rays.

There is no objection to using both methods of treatment at the same time, and there is reason to believe that the combined treatment will give better results than either used alone. There are a large number of cases of inoperable sarcoma treated either with the X-Ray or the toxins, in which inhibitory action is almost, but not quite, sufficient to check the growth, and it seems but reasonable to suppose that the combined action of the X-Rays and toxins might be sufficient not only to check the growth, but to cause it to disappear.

Technique.—I believe that it is impossible to lay down any dogmatic rules as to an ideal technique. The method is still in the early experimental stage; the question of the relative value of the static machine and the coil is still unsettled. The evidence at present would go to show, however, that the results are about as good from the use of one apparatus as another, provided the ray is sufficiently powerful. In tumors of large size a 12-inch coil is probably better than an 8-inch, and a

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high tube better than a low tube. My own cases were treated with the Willyoung and Queen 12-inch coils. The method is wholly experimental as yet, and we are merely groping in the dark and here and there picking up facts that promise, when correlated, of being of great value in perfecting our methods. There is already one serious result that has come from the laity having, through the press, obtained exaggerated ideas of the value of this method.

Patients with cancer, always with the natural dread of the knife, and prone to try all means first, are seeking X-Ray treatment when the tumors are in the early stages and easily removable. While some few of these cases may possibly be cured by the X-Rays, probably a larger number will become inoperable before consulting the surgeon.

Danger of Toxæmia.—From too vigorous an application of the rays in large and very vascular tumors, the rapid breaking down or tissue necrosis is followed by the absorption of so much of the toxins or products of degeneration, that the patient is liable quickly to develop the symptoms of toxæmia, which may easily prove fatal, as has been the case in several instances that have come to my knowledge. There is also the possible danger that in the rapid breaking down some of the living tumor cells may be carried to remote parts of the body, causing metatases.

With our present knowledge I do not believe we are justified in using the method in any but inoperable growths, and chiefly those of external origin. At present there is no convincing evidence that the X-Rays do much good in internal growths, for example, cancer of the stomach, abdominal organs, including bladder, uterus and rectum. I have tried the X-Ray in a number of cases of this character at the General Memorial hospital without much improvement. I should not advise the X-Rays in any operable growths. It is far better to remove the tumor and then give X-Ray exposures for a period afterward, as a phophylactic against recurrence. The value of this after-treatment can only be determined by systematic trial in a large series of cases over a long period of

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time. Yet there is a strong *a priori* reason for expecting beneficial results from such a source.

Conclusion.—Let us look for a moment at the results thus far obtained. We find abundant evidence that the X-Rays have an inhibitory action on all forms of malignant tumors. Yet, the number of cases is insufficient to enable us to state what particular varieties are most susceptible to this influence. So far it would seem that sarcomas primary in the lymph glands yield most readily to the treatment. Superficial epitheliomas might be placed in the same category. Several cases of recurrent carcinoma of the breast have been observed in which the growths have entirely disappeared after prolonged exposures of the X-Rays. Yet all these cases have been too recent to be classed as cured. In fact, *sufficient time has not yet elapsed in a single case of cancer treated with the X-Ray to justify us in regarding it as cured.* While this should, on the one hand, prevent us from reporting patients as cured in whom the tumors have merely disappeared under treatment, it should not, on the other hand, lead us to minimize the importance of these immediate results, even be they no more than a prolongation of life or an alleviation of suffering. One cannot witness the marvelous melting away or disappearance of an undoubtedly malignant tumor under a few weeks' or months' treatment with the X-Ray, without feeling that we have a new and powerful addition to our hitherto scanty means of attacking this disease. The knowledge of this new agent is so slight that there is added hope in our very ignorance. For by deeper insight into its nature, gained by further experience, we may hope to better utilize its power, and thus accomplish greater results. In the meantime, while the X-Ray has a legitimate place in the treatment of *inoperable* cancer, present data do not warrant us in advising the method *in primary operable cases.*



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AN INTERESTING CASE OF CARCINOMA.

(*Reported by H. Perkins Mosley, M. D., in American Medicine.*)

CASE VII.—Recurrent carcinoma of breast. Mrs. C., an English widow of 65. This patient was referred by Dr. A. J. McCosh.

History.—In February, 1894, she had an amputation of the left breast at a private hospital in this city. In 1900, the first time since the operation that anything abnormal was noticed, there was seen a slight discharge from the axillary scar. In June, 1901, small spots were noticed on the scar, and the arm began to swell. The scar, shoulder and arm gradually became very painful.

Physical Examination.—April 10, 1902: The woman is large and well nourished, and weighs 160 pounds. The left shoulder, arm and forearm are greatly swollen, somewhat edematous and tender. Over the scar of the removed breast, and also scattered over the front of the left chest and over the left scapular region, posteriorly, are many reddened hard, infiltrated spots, one-half inch to one inch in diameter.

Treatment was begun on the same day. Both the static machine and coil were used to excite medium and high tubes placed at 25 cm. distance from the area treated, the exposure being 5 to 10 minutes on alternate days. Both front and back were treated, usually alternately, but depending somewhat on the patient's desire for relief of pain. April 21, 1902, there was no change in swelling, but there was less pain. June 23: Swelling has diminished; recurrent spots are smaller, and much less painful; swelling at upper part of arm is less. Beginning June 23, the patient had daily treatment until July 4, skipping two days. The skin became quite red, and treatment was omitted until July 11, when it was found that the redness had all gone from the front. The back, however, is still red, otherwise condition is the same as on June 23. The patient wished to go to London to visit her family, and was instructed to keep up the Röntgen ray treatment there, but failed to do so.

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My note of October 27, 1902, on her return, is for about 10 days after the last treatment, July 11, 1902; patient says she was badly burned on the front of the chest and over the back. Large blisters formed, but the inflammation was controlled by wet dressings, and it was three weeks before the skin was normal. At present the swelling over the chest and shoulder is markedly diminished. Nearly half of the elevated tender spots of recurrence have disappeared entirely or have left merely a small lightly pigmented area. The edema in the arm and forearm remains about the same, and is very troublesome. The pain has returned since the treatment has been stopped. Her general health is fairly good, but she does not look quite so well as in the spring before she went abroad.

The case presents interesting features. Great relief has been afforded to what was regarded as an inoperable hopeless case by her physicians, the patient herself, and her friends. The relief of pain has been most striking from the very first, and the diminution of the swelling after the vigorous treatment she received just before she went abroad is marked.

The improvement in this case, as in many, seems to have continued some time after the treatment was stopped. The fact that it was about four or five days after the last treatment that the burn was first noticed is in accord with the observations of others, and impresses the necessity of the greatest care in the prevention of any burn, and the imperative necessity of absolutely stopping all treatment on the appearance of the slightest erythematous blush. In this particular case large areas were exposed to the treatment because of the wide distribution of the disease. During the treatment in the spring the patient's general condition improved considerably. Treatment three times a week was resumed on her return from England, with an immediate marked relief of the pain. The relief lasted about 30 hours from the time of the treatment, but after some weeks her general condition became so poor that further treatment by this method was deemed inadvisable.

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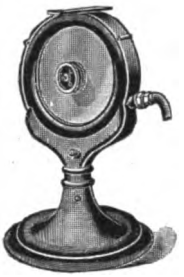
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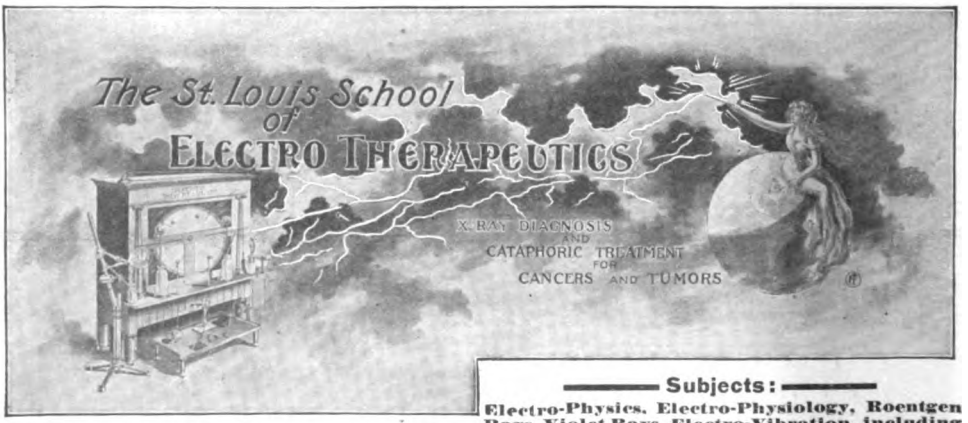
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Archives of Electrology and Radiology

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Original Contributions.

THE TREND OF MODERN THOUGHT ON THE SUB-ATOMIC STRUCTURE OF MATTER.*

By Arthur W. Goodspeed, Ph. D.,

Randal Morgan Laboratory of Physics, University of Pennsylvania, President of the American Roentgen Ray Society, etc.

Mr. Provost of the University of Pennsylvania—I have the honor on behalf of the American Roentgen Ray Society, as its president, to express to you our great appreciation of the cordial attitude assumed by you a year ago when approached as to the advisability of exerting my influence to bring our society to Philadelphia for its next meeting.

The result has been that not only are we holding our fourth annual convention in this city, but also under the fostering influence of this great center of learning, and the effect must surely be beneficial to our society.

Fellow members of the American Roentgen Ray Society—as representing, myself, one of the important scientific departments of this university, the third oldest in the country as a college, but the very oldest as a real university, I welcome you most cordially, feeling sure that the result of this meeting will add much to the credit and renown of our institution.

For my address this evening I am prepared to outline in simple language the present attitude of science toward electricity and its relation to matter, and I suggest as a title "The

*Presidential address delivered at the Fourth Annual Meeting of the American Roentgen Ray Society, at Philadelphia, Penn., December 9th, 1903.

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Trend of Modern Thought on the Sub-Atomic Structure ot Matter." It will, of course, be quite impossible in the time at my disposal to give the lines of reasoning or the methods of investigation which have led up to the present-day conclusions provisionally accepted in physical science. Those wishing to study the subject more in detail will find of use the partial bibliography which I append. Most prominent among the large number of authorities whose work furnishes strong evidence in favor of the views here to be set forth are Crookes, Kelvin, Rutherford and J. J. Thomson. Especially fortunate am I in having access to some excellent notes, taken by my colleague, Dr. H. C. Richards, on the lectures given by Thomson last spring at Baltimore.

Not very long ago it was the custom of teachers of physical science boldly to assert that matter and energy together comprised every conceivable existence in the physical world. Electricity and the aether, however, presented difficulties to this brief classification, though it was often predicted that at some time and somehow electricity would be shown to be a connecting link between aether and matter. To what extent this expectation has been realized will be apparent when we have taken a brief survey of the evidence about to be presented.

Tait in his charming little book on "The Properties of Matter" illustrates the "Objectivity of energy" by saying that it is being offered "For sale" or "For let." But surely accepting such an argument would imply far too much now in America. Indeed, the "Objectivity of *space*" would be proved beyond a doubt if we contemplate the success of our executive committee in selling to exhibitors the space on the floor below. However, the same author admits later on that "To have its price" is not conclusive of objectivity, citing as evidence that titles, family secrets and even college degrees are sometimes sold.

On first thought it would seem far easier to study matter than to study energy, and this is so perhaps if one does not proceed farther than to analyze and to classify the properties of bodies having tangible and visible size. We can, for example,

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find out nearly all there is to know about a certain piece of glass, considered only as a mass of glass of definite size and shape. We can measure its mass correct to one part in ten million; its linear dimensions correct to one one-hundred-thousandth of a centimeter; its density; its elasticity; refractive index; dispersive power, etc., etc., all to a high degree of accuracy. Suppose now we have made a similar physical examination of a definite piece of quartz; at once is suggested, why this difference in properties? They must be due to differences in the finer structure of the substances, not apparent by the grosser methods of examination. Chemistry now steps in with its beautiful analytic methods and classifies the many substances or kinds of matter composing bodies.

At any particular time in the history of science, say on January 1, 1900, any well-informed chemist would have told us that all substances are either elementary or compound, the number of the former class being definite, say seventy, while the number of compounds is far greater and less definite. At almost any subsequent date the number of elements would be stated as larger; indeed, in answer to the direct question put recently to our professor of chemistry, Vice-Provost Smith, I was told that the accepted number is now about seventy-five. This increase from time to time results from the dividing of a supposed element into two, or from the discovery of a new one, all the old ones remaining intact. The separation of didymium a few years ago into its *neo* and *praseo* constituents is an example of the former method, while the latter has been exemplified more recently by the discovery of several unsuspected constituents of the atmosphere—viz., the inert gases of the argon group.

(*To be continued.*)

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THE TREATMENT OF PYORRHEA ALVEOLARIS WITH THE X-RAYS.*

By Weston A. Price, D. D. S.,

of Cleveland, Ohio,
Professor of Electrology and Radiology at the Western Reserve University Dental Department, etc.

It is doubtful if any field for the therapeutic application of the Roentgen rays is more encouraging and promising of good results than the treatment of that stubborn malady of the oral cavity which causes the loosening and shedding of so many teeth, usually with much distress and a more or less constant flow of pus. It is commonly called pyorrhea alveolaris, also interstitial gingivitis, phagedenic pericementitis and Rigg's disease. In 1898 I made a series of studies with skiagraphs of the alveolar structure of a few typical cases of pyorrhea alveolaris, noting the diminution of the lime salts by the less density or absence of the bony tissues, and was particularly interested in one case which was especially aggravated. The flow of pus was profuse and the discomfort quite severe and continuous. The teeth, the lower left molars, were quite loose. I made several X-ray pictures of the case at sittings when inserting some fillings in the anterior teeth. The patient was urged to have the pockets and teeth thoroughly cleansed and treated, and an appointment was made for that purpose, but he broke it and was disinclined to make another, stating that the teeth were not worth the time. Some months later he came to the office and stated that for some reason his teeth were very much better, and on close examination I found that the tissues had lost their previous appearance and the presence of pus, which before had been so profuse, was scarcely discernible. The whole condition was very greatly improved. I saw the case frequently for the next year, and although the condition was quite distressing on the other side, this side remained quite free from either discomfort or pus. This case had about five or six exposures. I thought the X-rays might have had something to do with the results, but feared it was only a coin-

*Read before the Cleveland Dental Society, at Cleveland, O., Jan. 4, 1904.

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cidence; however, I determined to make a test case as soon as I would have a typical and extreme case.

I finally found such a case where the patient, Mr. H., aged about fifty, was willing to be experimented upon. He had been troubled a great deal for the preceding five or six years, during which time the right upper lateral had loosed and been lost, and the cuspid adjoining was very sore and somewhat loose and with a very profuse flow of pus. He said there had not been a time for years when he would not press a quantity of pus from the cavity every time he would put his finger over that tooth. The centrals were quite badly affected and the right cuspid just below also. About ten to twenty minutes were spent in removing any *readily removable* deposit and debris from all these teeth and an opaque mask was put over his face, being careful always to cover the lower cuspid and expose the upper cuspid root area. The test was to try exposing the worst tooth to the X-rays and protect the rest from them, very particularly the lower cuspid. The patient's business, and probably more than a little his lack of hope for any beneficial effect, made it very difficult to get sittings regularly, but a number of treatments were carefully made from one to two weeks apart, and whether incidentally or not, the pus rapidly disappeared from the upper cuspid being treated and continued with no change for the better around the lower cuspid. The congested and bluish angry gum with its gaping pocket gradually and quite rapidly changed to a pinkish white and the thickening reduced to about that of a normal gingival margin. A very marked change in the condition was that the gaping pocket constricted until the tissue hugged the root quite closely, so that it took perceptible pressure to pass a scaler between the tooth and gums into the pocket. There was a very marked change in the response of the tissues. Before the tooth was very tender to brush and the gums painful. It caused much pain to put an instrument into the sensitive pocket and after the series of treatments this sensitiveness disappeared. The patient described the change as being that before the tooth felt like a foreign substance and an irritant, and afterward felt like his

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own tooth. This tooth had no treatment that the others did not have, except the exposure to the X-rays. It is now nine months since the last treatment and there is no recurrence of pus or any of the typical symptoms around the tooth treated, but the lower cuspid which was protected still has its profuse flow of pus on pressure and also tenderness. The upper centrals were generally partially or wholly exposed during the treatments, and while the condition was not aggravated around them to start with, they too were very materially improved. I have had some others watch the results of these cases with me in order that a more correct judgment might be secured, among them Dr. McDill and Dr. Yahres.

Encouraged by this result, but feeling that it might all be due to some other unobserved cause, I tried some very difficult, unpromising cases. Mrs. C., age about sixty, stout and rheumatic, knew of the encouraging results of the last case and begged to have the treatment applied to her teeth. The upper cuspids, particularly the right, were very bad, but her lower centrals and cuspids were worse, indeed very bad. The loose lower incisors had been supported by a splint attached to the cuspids, and the gums about them all were very much inflamed and swollen, and I think the most sensitive tissue I have ever tried to work around. I tried to remove the debris around the roots, but could not go into the pockets. After a few treatments I could work around the cuspids and laterals, but the centrals were still very sensitive. From the first the hemorrhage had been profuse and a dark blue, indicating a very stagnant circulation. I took a skiagraph of the teeth and found the attachment gone almost entirely, even to the apices of the centrals, and decided that the splint was about all that kept them from dropping out, and accordingly removed their attachments to it and easily took them away and replaced them with artificial teeth attached to the same splint.

The treatments were continued once or twice a week until in all about ten or twelve treatments were given, always protecting the very bad upper right cuspid from the rays in order that a good test might be made. The pain was

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so much relieved after the treatments that the patient entreated me to make very frequent exposures to the rays. My fear and dread of burning the patient or of over-treating and the difficulty of protecting her and the inconvenient apparatus I then had to use to make the application restrained me from very frequent treatments until I could perfect something better. It is very significant that, though the lady had to come a long distance and was not able to get on and off the cars without considerable difficulty and danger, she would telephone between appointments for permission to come, giving as her reason that her gums felt so much better for a day or two after treatments. The results were that the soreness and swelling and redness, and particularly the presence of pus, were quite entirely removed from all the lower teeth exposed. The gums took a very normal shape and light pink color, constricting about the teeth, and a very signficant condition is that while hemorrhage is produced with some difficulty, it is red blood instead of a dark blue, showing a very marked improvement in the functional activity of the tissues.

The upper cuspid, which was protected from the rays, showed no marked improvement, if any. This was the condition when I left last June for my vacation, and her lower teeth have kept improving since that time. It is a strange coincidence that the upper cuspid, which had exactly the same treatments as these lower teeth, viz., removal of easily accessible debris—except that it was protected from the X-rays—should have fared just like the protected teeth of the last cited case, viz: got worse, while those treated got better.

On my return from my vacation this elderly patient was on hand to have this upper cuspid treated. The flow of the pus was very profuse and the tooth very sensitive to concussion. The inflamed gums bled on the slightest irritation, but a very dark blue blood. No treatment was given except the removal of the accessible debris and deposit and the exposure to the X-rays, and in six weeks the presence of pus was almost entirely relieved and the gums had become quite normal in shape

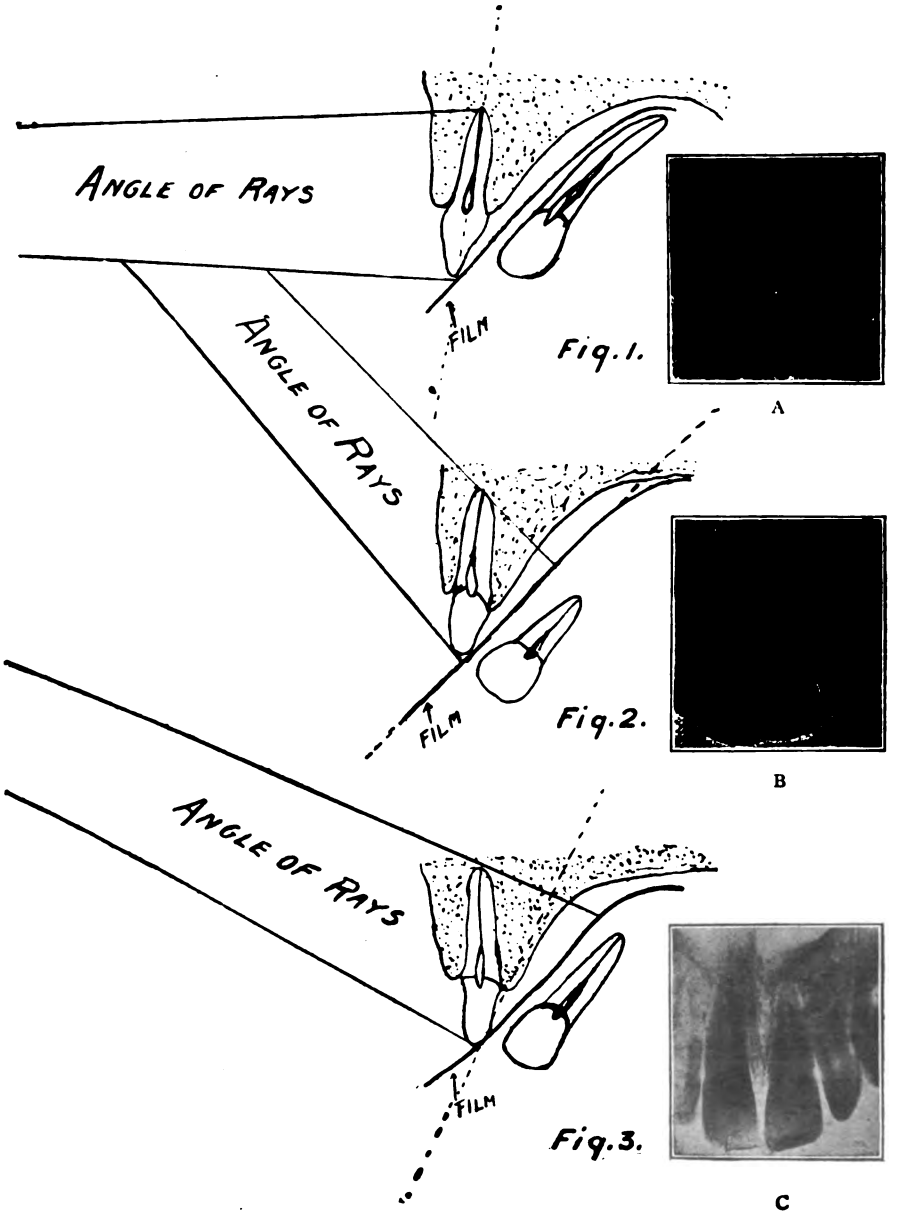
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and color. She left the city at that time and I have not seen her since.

She has lost in the last ten or fifteen years about one-third of her teeth, notwithstanding what she tells me has been very thorough treatment.

The next case I will report was Miss F., age about twenty-eight or thirty, who is under treatment at present. The condition was one of very unusually acute pain and sensitiveness. The pockets were very deep, the first upper right molar was as sore and painful as if abscessed, and in fact, we thought it was until I took a skiagraph of it, finding that there was no trouble at the apices of the roots, but the alveolar process was gone in some places to the last third of the roots. The left lateral was elongated about a sixteenth of an inch or more and very loose, and was so painful to touch that she could not for a long time even bite into bread with it. This tooth had a liberal flow of pus and the hemorrhage was very profuse, but very dark in color. Very little debris or deposit could be removed from it, owing to the extreme painfulness, and I desired to avoid using sedatives or medicaments of any kind in all these tests to avoid sources of error in conclusions. This tooth was considered hopeless when we started and was only treated for an observation of the change of symptoms. By the third or fourth treatment the tenderness of all the sore teeth had gone and a very marked diminution in the pus formation had taken place, and by the tenth treatment the color of the gums was almost normal. A most significant change was in the access to the pyorrhoea pockets, the gum tissue was constricted around the teeth in a most surprising and gratifying manner. No means was used to make rigid the loose lateral, which seemed loose enough to be picked out easily with the fingers. As the patient expressed it voluntarily, "That tooth has lost all its painful tenderness; why, it felt just like something that did not belong there, but now it feels just like my own tooth. Why, I bite into apples or anything and never think of it." This skiagraph (Fig. 3), made when the treatment was begun, shows the depth of the pocket all around the

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tooth, and certainly the tooth should properly have been supported for any kind of treatment, but was not in this case to add to the difficulty of the treatment, and to exclude all treatment except the X-rays. The patient has been under this treatment for just eight weeks, having had just sixteen treatments, and for some time has felt no discomfort, she says, from any of the teeth, and all of them are very much improved. They are not cured yet, but very greatly improved.

I have treated less faithfully several other cases for aggravated conditions, and because the experiments were not so carefully carried on and for lack of time will not report them in detail, but in general make this statement, that in no case could I discern any deleterious or undesirable effects, and in no case that could be said to have been treated at all faithfully was there the absence of some improvement in the conditions. In some cases where only one or two treatments were made I could not discern any changes. A couple of cases that got only a very few treatments seemed to improve at first and then go back after the treatments were discontinued.

It is too soon to judge whether the improvement in those cases, apparently greatly helped, will be permanent.

I shall explain my method of making the treatment. When I started this experimenting I did not cover the patient, but treated through the lips and cheeks. Later, in order to protect the patient, I devised an opaque cloth and cut a hole in a blanket of it, and with it covered the patient's head and shoulder, with the hole over the patient's mouth, or part of the mouth. Later I made a tube shield with a mouthpiece, which cut off all the rays from the tube except what would go through the cone and mouthpiece. Now I am using a very small, specially designed tube right against the tissues, with a relatively small volume to allow for the difference in the distance, for the concentration of the rays is inversely in proportion to the square of the distance from the source of the rays.

This new tube which I have devised will, I expect, very greatly simplify and add to the convenience of making these applications. It reduces the inconvenience of the application

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very considerably and allows of treating the teeth from the inside as well as from the outside, which has been the only way heretofore, and also protects all parts not desired to be exposed. Since the distance between the source of the rays and the tissues has been reduced in the tube from ten or fifteen inches, as first used, to one-half inch, the time is reduced not in proportion to the difference in the distance, but the square of the distance, and hence if the same volume of X-rays were used, if it took five minutes for a proper exposure at ten and a half inches from the tissues to the anticathode, it would take $\frac{5 \times 1}{10 \times 10}$, or one-hundredth of five minutes, or three seconds, at one-half inch distance, which distance I can use with this special tube. Notice I said if the same volume of X-rays were used, but we do not and cannot use nearly so large a volume in this tube, probably about one-tenth as great, so we must regulate the time accordingly, say 30 seconds.

I believe thorough, very thorough if possible, cleanliness of the pockets should be secured for any possible kind of treatment of this disease, and suitable washes and sterilizing solutions should be used liberally. Please note that purposely this was not done with any of these cases to exclude errors in conclusion. Since we can with this new form of tube treat the gums from both the inside and outside and at close range, we do not require so high a penetration, and accordingly do not require a large coil. There are very necessary precautions for protecting the patient's lips and hands from the effects of the rays, which are to always have all the tissues not necessary to be exposed protected or shielded by some substance that is opaque to the X-rays. My new tube is provided with this. I have devised an opaque rubber cloth that is very satisfactory for protection, being both flexible and very opaque. All tissues, whether the patient's or the operator's, become more and more easily influenced by the X-rays under continued exposure, the effect being cumulative. This should be borne in mind.

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DISCUSSION.

Dr. J. M. Yahres—Through the kindness of Dr. Price it was my good fortune to see the cases referred to in this paper on the treatment of pyorrhea aveolaris with the X-rays.

In the first case, that of Mr. H., I saw it after the second treatment about a year ago. The tooth under treatment, the upper cuspid on right side, had about it a very angry-looking gum tissue of bluish red color, a constant accumulation of pus and very deep pockets.

Mr. H. told me he could by pressure remove pus from the pockets many times during the day. The lower cuspid on the same side was also in a bad condition, but was shielded from the action of the rays so that he might the more positively ascertain the results of X-ray treatment on the upper tooth.

To-day I saw the case again. The gum tissue had lost its angry look and appeared almost normal, the flow of pus had ceased and pocket had decreased from five eighths to about one-eighth of an inch in depth.

When we consider the fact that the last treatment to this tooth had been given nine months ago, that no medicaments had been used and that the lower cuspid which had been shielded from the action of X-rays was in the same condition as before, we cannot but say there has been a great change wrought through the action of the X-rays.

The second case, that of Mrs. C., I saw but once. I therefore cannot say much other than repeat what she said regarding the treatments at that time. She seemed to be delighted with the effects of the treatment and said the only trouble was that the doctor could not give her an appointment often enough to suit her.

The third case, that of Miss F., I saw but twice. The first time about three months ago, just before receiving the third treatment. I found pus, deep pockets, elongation of tooth and extreme soreness, so sore that the patient could not allow anything to touch it when eating. I saw the case to-day and found pus had ceased to flow and patient said all soreness had disappeared and tooth felt as if it belonged to her.

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As the doctor says in his paper, he does not claim these cases as cured, and we all know that a year is too soon to judge of the treatment of this condition.

Yet we all must admit that there certainly was a great change wrought in the case of Mr. H., and as the X-ray was the only means used, it must get the credit. We believe Dr. Price has opened a new channel for the relief of the suffering and trust it may lead to a cure of this, our worst enemy, who greets us so often and yet of whom we know so little.

Dr. J. W. McDill—My location in the city and the kindness of Dr. Price has given me the pleasure of watching these very interesting cases. The paper is to a degree a scientific one, and yet it can hardly be classed as a scientific paper as easily as it can a practical one.

In the face of so many failures incident to the introduction of many new ideas and theories one comforting thing crops out in the paper almost as a preface. The essayist modestly lays no claim to cures; in fact, he cites no cases as cured, simply cases benefited, cases seemingly cured either directly or indirectly from the application of the Roentgen rays.

About twelve months ago in the case of Mr. H. the upper righ cuspid presented a typical case of pyorrhea alveolaris

The tooth seemed very loose, extremely sore, especially so when molested. The tissues around the tooth were highly inflamed, quite badly receded and had lost their attachment; in fact, so much so that an instrument could be inserted along the root for more than half an inch.

This operation caused a profuse hemorrhage. Pressure upon the parts adjacent would always bring a flow of pus. The right lower cuspid presented almost the same appearance.

Without removing much of the debris or calculus from the upper cuspid the X-ray was applied. During this procedure the lower cuspid was protected with a special opaque cloth, which prevented action of any kind upon it.

After the lapse of twelve months the upper cuspid tooth seemed to be in a normal condition.

Inflammation having disappeared, the tooth seemed tight in

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the process, the tissues seemed perfectly attached about the gingival margin, precluding the possibility of introducing an instrument at all places.

The pus had entirely disappeared and what blood did flow was of a healthy red color, while before it was of a dark bluish tinge. The lower cuspid, which had been protected from the X-rays, was in even worse condition than eight months ago.

The case of Miss F. was very similar to the former. The tooth in question being a left upper lateral incisor, very loose, a large quantity of pus about the root, tissues highly inflamed and elongated one-sixteenth of an inch. An instrument could be inserted almost to the apex of the root and the sensitiveness interfered very materially with mastication. Biting into an apple, as Miss F. said, caused excruciating pain.

As before, without removing much of its debris or calculus, the tooth and tissues adjacent were exposed to the X-rays.

The treatment thus far has been very gratifying indeed, as the tooth now seems tight, the tissues are in the normal condition. The hemorrhage is of a healthy nature. The soreness has disappeared. An instrument is inserted with difficulty above the gingival margin, and while the tooth is still elongated, much can be done by placing it in its normal condition by the use of some rigid staying appliance.

I trust these may develop into permanent cures instead of only giving temporary relief, and thus aid us in coping with a very troublesome, obstinate and discouraging condition which we so often find.



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*THE THERAPEUTIC EFFECTS OF THE X-RAYS, AS SHOWN FROM THE RESULTS OF TREATMENT OF NEARLY ONE HUNDRED CASES.

By Henry K. Pancoast, M. D.,
of Philadelphia, Pa.

The following report is based upon the results of treatment of nearly one hundred patients at the Hospital of the University of Pennsylvania during the past eighteen months by Dr. Harvey Bartle, Mr. Henry C. Welker and myself. It does not include a few cases of skin diseases, as I prefer to omit the subject of diseases of the skin, not being a dermatologist. A great surgeon has been quoted as saying that there were two kinds of skin diseases in his opinion—those that zinc oxide would cure and those that zinc oxide would not cure—and our knowledge of the subject is but little better. It seems rational that X-ray specialists, like surgeons or nose and throat men, cannot be skin specialists when treating cutaneous diseases with the X-ray as a therapeutic agent, any more than when usnig any other means of treatment, and I do not feel that we should deal with skin lesions unless thoroughly familiar with that branch of medicine, for we are using an agent that may do great harm, and we may not know how far to go with it, or whether a case is improving or doing badly. Let the dermatologist use the x-ray himself as a part of his therapeutic armamentarium.

We will here consider the subject of tumors, including sarcoma, carcinoma, epithelioma, lupus and keloid. No doubt very many of the members of this society are extremely enthusiastic over the X-ray treatment of cancers, sarcomas and other growths, and it is to be hoped that we will hear from them in the discussion of this report. When I first took up X-ray work, I felt that it was to handle a force that might possibly revolutionize the whole practice of medicine; that it was a "cure-all" for all tumors, especially the malignant ones; and that it would nearly always yield the results desired and

*Read at the Fourth Annual Meeting of the American Roentgen Ray Society, at Philadelphia, Pa., December 10th, 1903.

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expected. Such ideas were formed from reading the reports made in various medical journals and newspapers. How many of us realize that it is mainly the cases cured or progressing favorably that are reported, and not often the failures? What a volume the latter would fill! I must confess that up to the present time I have been very much disappointed in the results obtained from the X-ray in the treatment of cancer and sarcoma.

In the treatment of the important growths, namely, sarcoma, epithelioma, and carcinoma, I feel that the percentage of cures to be obtained at the present time is not over ten, taking all the cases into consideration that come to us for treatment, the hopeful and the hopeless. This is, no doubt, a radical statement in the minds of many, but there are certain well-defined reasons for such results in a large charitable institution.

In the first place, most of our cases included in this report, were treated in an institution as out-patients. Such individuals do not come in for their treatments regularly. If the weather is bad or they do not feel disposed to go out, they stay away, and this, of course, interferes very much with the satisfactory progress of the treatment.

Secondly, out-patients usually all come at some particular time of the day in a body. Your time is limited, you are hurried in your work, and you do not have sufficient opportunity to examine each case as you would like to, and as you should. It is not like having cases come to your office, where you can question and examine each one carefully.

Thirdly, office patients are paying for what they receive, are more interested in their own well-being, and therefore come regularly and as often as is required for treatment, and the results are better beyond a doubt than in the case of hospital out-patients. No one will doubt that the application of the X-rays is not the only part of the treatment of our patients suffering from malignant tumors. To obtain the best results, each case should be made a careful study in itself, both as to the local condition and the patient's general health.

Fourthly, it must be borne in mind in this connection that

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the X-ray room or laboratory in any large institution is in a manner looked upon as the "dumping ground" for material that cannot be successfully treated in the other departments. For instance, when nothing more can be done with the knife, the case is turned over to the X-ray man to see what he can do. This is perfectly justifiable, for our grandest hope is to do something for just such hopeless cases, when the only chance lies in the Roentgen ray treatment, and with these poor sufferers we have the incentive offered to put forth our best efforts in the improvement of our technique. A high percentage of cures often means that hopeless cases have been refused treatment, and 10 per cent of malignant cases cured in a large hospital at the present time, I feel to be a favorable outcome.

There is no doubt that the X-ray treatment has given some marvelous results, such as will be obtained from no other form of treatment, and it is probable that improvements in technique and apparatus, and increased knowledge of tissue changes under its influence will in the future bring about much better results than we obtain at the present time. I am not discouraged by our failures to affect cures in more cases, as I feel that we are apt to be over-enthusiastic and to expect too much of a practically new and not thoroughly understood therapeutic agent.

The Roentgen ray will probably never supplant the use of the knife in the removal of growths in dangerous areas. It is almost criminal for anyone to advise X-ray treatment in such cases as carcinoma of the breast or epithelioma of the lower lip. This treatment takes too long a time, and in the meanwhile the patient is liable to metastasis to areas beyond our reach. This has been only too frequently seen in such cases in which the patient has refused the knife, and we have been obliged to apply the rays against our better judgment. It is in these cases that we find a loophole for quackery. I feel that in a very large majority of cases of cancer in which the X-ray is advisable in treatment, the application should be preceded by the removal of as much of the growth as possible by the knife

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or curette. Cosmetic results on the face form, of course, one of the strong exceptions to this rule. One of my main objections to X-ray treatment from the therapeutic standpoint is the very great inducement it gives to quackery, and I see no reason for giving any mercy to the "quack" using this agent for what should be legitimate medical purposes only. I am very much opposed to the use of caustics in conjunction with the X-ray treatment, as they are altogether destructive in effect and interfere with healing, and cannot compare in efficiency or safety with the knife or curette. It seems hard to conceive how any case that cannot be aided by the X-ray man can be helped by the addition of caustic applications.

I feel certain, as I think many of our members do, that in some cases the X-ray may do more harm than good, but at the present time we cannot distinguish such cases from the rest. It may be that in certain instances death has been brought about sooner than it would have otherwise occurred. For this, we cannot be held in any way accountable, and if made a medico-legal question, it should be our duty to make it a point of no import. The following cases are reported as examples of some in which X-ray treatment is of little or no value. Let it be acknowledged that this agent is of very little value in curing such cases, and even if death be hastened thereby, we still know that the patient would die under any circumstances, and we have put forth our best efforts at a cure, that we have a good chance of relieving pain, and that we are doing the best we can do.

(*To be continued.*)



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Editorial.

We regret to be obliged to apologize to our readers once more for a belated issue, but the additional work necessitated by the total destruction of our Journal equipment, the changes in the plan and scope of the Journal, etc., have made it impossible to complete the number on time.

We are going to make up for the delay by issuing the April number at once, and hereafter, beginning with the May number, the Archives of Electrology and Radiology will be mailed on the fifth of the month instead of the twenty-fifth as heretofore. It is intended to make the departments of Current Electrology and Radiology which is introduced for the first time in this issue, and Miscellaneous Abstracts a prominent feature of this publication, and by changing our date of publication as above stated we shall be able to supply our readers with the current scientific thought of the day three weeks earlier than heretofore.

THE FUTURE OF ELECTROTHERAPY.

Electricity in its therapeutic capacity has undergone more extreme vicissitudes in the way of popularity than other remedial agent now before the medical profession, with the possible exception of psychic suggestion. It was first employed in medicine to any considerable extent in the time of Franklin, and in the form of the static current, and it is interesting to note the enthusiasm with which its advocates were impressed at that time. One is also struck by the similarity between the class of disease conditions in which it was found useful according to the medical literature of that period and the conditions in which it is esteemed of value to-day, and in the methods of administration employed then and now.

As the physicians of that day had but an inadequate knowledge of either pathology or the physiological action of electric-

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ity however, and none whatever of current differentiation, the particular forms of disease to which its physical properties render it logically applicable were not then susceptible of demonstration. As a consequence it was called upon so frequently to influence abnormal conditions which our increased knowledge has taught us it would be impossible for it to influence, that a multitude of failures resulted and the remedy soon fell into general disrepute. Up to ten years ago this same fate followed each successive resuscitation of the remedy.

Enough successes were continuously obtained, however, to keep the subject alive in the minds of a few earnest thinkers, and knowledge of its powers and of the directions in which they may be logically expected to exert beneficial influence, has gradually accumulated until to-day there are available enough established facts to constitute a firm logical basis upon which to build the electrotherapy of the future.

The astonishing development of electricity in the industrial world, whereby study of its physical properties has been stimulated, has had a vast deal to do with bringing this agent to the fore in therapeutics. Improvement in the construction of instruments for current production, modification and control, whereby efficiency and precision of administration were obtainable, has also been a most important, in fact, an indispensable element in leading up to its present stage of development. By far the weightiest of the factors which combined to place electricity in the prominent position it occupies to-day in the pro fessional mind, however, was the discovery of the X-ray, a physical force absolutely unique and invaluable in its practical diagnostic applications, and exhibiting therapeutic capacities which have already revolutionized prognosis and treatment in a number of diseased states. Just how prominent a part electrical phenomena will be found to play in explaining the characteristic behavior of the recently discovered radio-active bodies, radium, etc., only the future of course can decide, but present indications point to a more or less intimate connection.

The future development of electricity as a remedial agent must proceed by way of study along rational, scientific, physical

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lines, which may be roughly designated as follows: First, current differentiation, viz., the establishment of the distinctions between the continuous (galvanic), induced (faradic), static (Franklinic), and high frequenecy currents with their various modifications; second, the differences in the physiological actions of these various modalities; third, the rational applicability of these different physiological activities, as regards their corrective power, to the ascertained pathology of the departures from the normal for which it is desired to find a remedy. It will readily be seen, therefore, that the time has come when the prescriber of electro- and radio-therapy must study these subjects with the zeal and conscience of a scientist, and that whether or not success and satisfaction attend the employment of the measure will depend very largely upon whether or not he is well versed in physics and pathology from the teachings of which are derived the rational basic principles of its clinical application.

As was remarked recently by a well-known practitioner, "It requires as much skill and study to apply electricity to the treatment of disease as to do a laparotomy," and a surgeon of world-wide reputation has stated as a result of his observation that "every man who goes into electro-therapy with a proper equipment, mental and otherwise, becomes an enthusiast." Both of these remarks are full of a significance that will be more and more appreciated as the electro-therapy of the future gives up its treasures.

THE ACTION OF RADIUM RAYS ON TISSUES, EGGS AND ANIMALS.

We have recently received many inquiries from our readers in reference to the physiological influence of radium, and an editorial with the above title which appeared in the British Medical Journal for February 13, 1904, sets forth so fully what is at present known in this regard that we reprint it in full as follows:

"The action of the Becquerel rays emitted by radio-active bodies has, owing to their effect on the skin, attracted the

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attention of the medical world. Walkhoff, in 1900, showed that those who worked with radio-active substances were liable to suffer from a form of dermatitis like that produced by the Roentgen rays. Becquerel describes how he suffered from carrying in his vest pocket for two hours a very active preparation of radium. Fourteen days afterward the skin corresponding to the position of the radium showed signs of inflammation; the area gradually increased, and ultimately a large and deep ulcer formed, and did not heal for months.

"Danysz found that the action of radium on the skin is never immediate. At first nothing is felt, but on the eighth, fifteenth, or even twentieth day there is some congestion. This long latent period is one of the most interesting and mysterious facts about the action of Becquerel rays on living tissues. A sample of barium chloride, containing about 50 per cent of pure radium is, according to M. Curie, 500,000 times more powerful than metallic uranium, and produces an appreciable congestion of the skin in a few minutes. If placed in contact with the skin of a guinea-pig for twenty-four hours, it causes complete destruction of the epidermis and dermis. Contact for forty-eight hours does not produce any deeper ulceration. The deeper connective and muscular tissues are little affected. If the radium be placed under the skin a relatively feeble effect is produced on the epidermis, and even less on the connective tissues and muscles. The epidermic tissues seem to absorb the rays that produce the pathological effects. The skin of the guinea-pig is much more sensitive than that of the rabbit; indeed an exposure that produces alopecia in the guinea-pig may cause a growth of hair in the rabbit. A tube of radium placed from one to four months in the peritoneal cavity produced no lesions comparable to those on the skin, and the intestines and serous membranes seem to be very slightly sensible to these radiations.

"The nervous system is much more senstive than the epidermis. A tube of active radium placed under the skin over the vertebral column and part of the cranium of a young mouse 1 month old caused at the end of three hours paresis and ataxia,

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after seven to eight hours, tetaniform convulsions and death in twelve to eighteen hours. Mice, three to four months old, died with the same symptoms in three to four days, and those one year old in six to ten days. Guinea-pigs, eight to twelve days old, similarly treated for twenty-four to forty-eight hours, but with the tube applied to the lumbar region, suffered in one to three days from complete paralysis of the hind quarters and tetaniform convulsions. Death ensued in six to eight days. Adult guinea-pigs and rabbits treated in the same way did not show any nervous troubles immediately, but died with skin lesions some weeks or months afterwards. An adult rabbit in which a tube was placed under the dura mater for eight hours showed nothing abnormal for two days, but on the third it had hemiplegia. It would seem, therefore, that the nerve centers sensible to these rays are very effectively protected by the bone in adults, while the cartilaginous tissues of young animals do not afford much resistance to the passage of rays.

"The larvae of insects kept in a tube with radium for twenty-four hours died in two or three days; in them, too, the nervous system was most affected. When soluble salts of radium are dissolved in distilled water the emanations are dissolved by the water, and act on insect larvae much like the substance itself. They also make the cuticle brown on its dorsal surface.

"Becquerel's rays affect microbes in varying degrees. In all development is interfered with, but some—and notably those that produce proteolytic autodigestion—are killed under certain conditions. The bacilli of anthrax fail to develop if they are placed for twenty-four hours in contact with these emanations.

"The effects on animals so far described were produced at close range, but the rays emitted by radium can also kill at a distance. London has found that if 30 mg. of radium be placed over a cage of mice for one to three days the animals become ill on the third day, and die on the fourth or fifth. The first effects are redness of the ears and blinking of the eyelids; then follow drowsiness, refusal of food, slowness of

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movement, and feeble response to mechanical stimuli. At the fourth day there is coma with paralysis of the hind legs. In deepest coma the spinal reflexes may be exaggerated and the respirations slow and even scarcely appreciable. There is thus marked depression of the cerebral nervous system and exalted excitability of part of the cord. The respirations finally cease, and death occurs. After death the hairs on the back could be pulled out in masses, and often the epidermis came with them. The subcutaneous tissue was greatly congested. The chief histological changes were produced in the skin and cortex cerebri.

"The effects of radium on the blind are interesting. Blind persons slightly susceptible to light get a sensation of light when radium is placed over one or other eye. Persons who can just distinguish light from shade, but cannot distinguish form, when placed in a dark room, can distinguish the outlines of an object projected on or placed in a screen illuminated by radium.

"Radium rays exert a marked influence on the eggs of sea-urchins, which in the course of development pass through the three stages—ciliated blastula, the hollow gastrula, and the pluteus larval stage. If blastulae are exposed to radium rays for forty minutes the gastrula is not formed, though the ciliary movements become more intense. If gastrula are exposed, the pluteus is small and atrophied. Spermatozoa, are rapidly enfeebled and killed by these rays, while ova may be more readily fertilized. Ova exposed to radium rays may develop irregular embryos by parthenogenesis without the action of a spermatozoon. These results may be due to the action of the rays on the chromatin of the nuclei, augmenting its activity or destroying it according to the length of exposure—that is, the rays kill the spermatozoid, a mass of chromatin, but excite the ovum protected by its protoplasm, and cause parthenogenesis.

"They do not seem to have a specific action on definite tissues. They act on the ectoderm of tadpoles and on the endoderm of gastrulae of sea-urchins, probably because the cells

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are in a state of evolution and differentiation. In man the skin, which is always being renewed, is attacked, not the muscle.

"The causes of these remarkable changes in normal and pathological tissues are not fully ascertained. Whether they be caused by ultra-violet light rays, by Roentgen or Becquerel rays, there is always a primary cell degeneration, followed by secondary inflammatory reaction. Professor O. Giesel states that paper in which radium preparations have been preserved for a long time becomes brown and brittle, the cellulose loses its solidity, and it is obvious that radium rays cause molecular disturbance. This may explain the results in animal and vegetable tissues.

"G. Schwarz has made some experiments which show that the rays have a special effect on lecithin. He fixed a capsule containing 2 cg. radium on the shell of a fresh egg of a fowl for 144 hours in a dark protected place. The surface of the shell became brown in color, but there was neither coagulation nor gelatinization of the egg white. The yolk, however, became greenish gray in a limited area, and more rigid, and had a peculiar taste and odor; the embryo did not develop. The rays seemed to decolorize the organic body lutein, both in the absence and presence of oxygen. The odor and taste of the altered and putrefied yolk was due to the decomposition of lecithin setting free trimethylamin. The importance of this action on lecithin is wide-reaching, for this substance is found in all rapidly-growing tissues, normal and pathological."



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Miscellaneous Abstracts.

FIFTEEN YEARS' EXPERIENCE WITH UTERINE FIBROIDS.

In a paper read at the annual meeting of the Medical Society of the State of New York on the 27th of January, 1904, Dr. W. E. Ford of Utica, U. Y., gave his personal experience in the treatment of fibroid tumors of the uterus during the past fifteen years. The cases were taken from those treated at St. Luke's Hospital in Utica, whose histories, after their treatment, had been followed, and the conditions of the patients noted. It was not an argument in favor of any particular method of treatment, but dealt with that period in which fifteen years ago the most distinguished men, both abroad and at home, were discussing the merits of operative treatment as compared with the results obtained from treatment by galvanism, according to Apostoli's method, and from that time during the discussion of the various methods of operative procedure down to the present time, when the author assumes that the profession is pretty well agreed that certain fibroid tumors of the uterus ought to be removed by surgical procedure.

Since 1894 he has been operating by supra-vaginal hysterectomy after Baer's method. The whole number of cases reported is 162. In the earlier years these were treated by galvanism, for though the author states that he had operated a few times (six) for the removal of large fibroids by abdominal section, bringing the pedicle out of the wound after the manner of the extra-peritoneal method of that day, he did not until 1894 do his first operation by dropping the stump back. Of this whole number 96 were treated by electricity with the following results:

"It is fair to say that the treatment by Apostoli's methods I had witnessed in his clinic, and that the current I used was a six-ampere, 40 volt current, with the milliampere metre in circuit registering from 50 to 100 milliamperes. Seven of these

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cases recovered as indicated by the disappearance of the symptoms and the tumor. Twenty-six were improved as to the symptoms of hemorrhage, pain, etc., so as to be able to resume their duties in life. Some few of this class relapsed after a year or two and were treated again in the same manner, and then remained well for a period of five years at least afterwards.

"The next class of cases, and by far the most important, numbers 25, whose histories I have been able to follow for at least five years subsequent to their treatment, and who were improved, as indicated by the facts that the tumor was smaller and continued to diminish in size after treatment was discontinued, and who remained in good health and were able to do their work. I could add materially to this list from my private practice. Six were unimproved in any particular. One case died as the direct result of infection. The cause of death in this one case was due to the lighting up of an acute inflammation in an old gonorrhoeal salpingitis, which in those early years I did not have the skill to diagnose, and which produced a rapid sepsis. This is the only instance of accident or injury of a serious nature that has occurred to me in my use of this very heavy current of electricity. During that time when the discussion as to the treatment of these tumors by surgical means was hottest, and along about 1890 to 1895, it was charged by many who advocated operative procedure and who were skilled operators, that electricity had done harm in a number of cases, upon which they had afterward operated, and had lessened the chances of recovery by operation. I was not so well qualified to speak at that time on this question as I am now, but my impression was that the changes found in the tumors operated upon and which were attributed to the deleterious influences of electricity, were not due to the current, but were due either to an infection from its improper use, or to the degenerative changes in the ovaries, tubes or the tumor itself, which we now know to be most common in cases that have had no treatment until the operation for their removal. I still have this opinion, and while I now practice the operative

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treatment of fibroids, I cannot condemn the use of electricity on these grounds."

His conclusions, after discussing the methods of operation and the results obtained from various methods of treatment, such as tying the uterine arteries, curetting, the administering of various drugs, such as ergot, animal extracts, etc., are as follows:

"It is not possible to tell in advance what will happen to a medium-sized fibroid when it is first found. My rule now is to remove by operation any fibroid that is threatening life by hemorrhage, any soft myoma that is rapidly growing, any very large tumor that gives pressure upon the adjacent organs so as to make an invalid of the woman, or any tumor that seems to be undergoing a degenerative change, as is evidenced by general sickness and especially by rise of temperature and soreness across the abdomen.

"On the other hand, small fibroids have remained almost stationary under my personal observation for fifteen years, and are still in pretty much the same condition as I first found them. A few tumors have disappeared without our knowing the adequate cause. It is my firm conviction that no other treatment than surgical is of much service; but if a patient declines for any reason, such as heart lesion or kidney disease, to have surgery done, then galvanism will do more than any other remedy in intramural growths. In those that are most likely to require emergency treatment in hemorrhage, etc., galvanism if used intelligently and persistently relieves a large number of women of their symptoms, and cures a few cases."

ARTIFICIAL FLUORESCENCE OF LIVING TISSUE IN RELATION TO DISEASE, by William James Morton, New York, N. Y. Med. Journ., and Phila. Med. Jour., Feb. 13 and 20, 1904. The author's idea is that by administering internally solutions of substances that are fluorescible by radium radiations or the X-ray, the violet, ultra-violet and other rays so producible may be excited within the body when the X-ray or radium radiations are caused to impinge upon it; that the blood and tissues which are permeated by the solutions admin-

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istered, are thereby rendered fluorescent. By this means a deeply located disease process could be flooded with therapeutically active light, the beneficial power of which would not be vitiated by its having to pass through tissues which would absorb some of its elements before it came in contact with the tissue which it was desired to influence.

Substances noted as efficient for this purpose, and which can be administered safely, are aesculin, quinine bisulphate, fluorescin, resorcin, orcin, eosin, fraxin, uranin, rhodamin, petroleum jelly and salicin. The two first mentioned are preferred, aesculin in .065 gram doses and quinine bisulphate in .3 gram doses, largely diluted with water and administered a few hours before treatment is given. Aesculin is the most highly fluorescent body now known giving rise to this phenomenon in a solution of one part in one million; quinine bisulphate fluoresces in a solution of one part in fifty thousand. Dr. Morton has used both radium and the X-ray to excite fluorescence, but prefers radium.

Cases of Hodgin's disease, mammary cancer, rodent ulcer, papillomatous abdominal growths, etc., are cited in which results were obtained that Dr. Morton is convinced could not have been secured by the use of the X-ray or radium alone. He is firmly convinced of the therapeutic value of the development and closes his paper with a plea to the profession, not to frown it down, as is so frequently done with regard to new things, but to "investigate; sceptically, if you will, but investigate."

ROENTGEN RAYS IN THE TREATMENT OF PRURITUS ANI— J. R. Pennnigton, Chicago, Ill., N. Y. Med. Jour. and Phila. Med. Journal, Feb. 20, 1904.

The author was led to try the X-ray upon pruritus ani by reason of the power which it exhibited of stimulating and increasing the activity and vitality of healthy, normal, tissue cells, and of destroying pathologic cells, as shown by the histological studies of Gilchrist and Kibbie, Oudin, Barthelemy, Darier, and others. Thirteen cases are reported, six of which were ordinary instances of the disease, three were unusually obstinate

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or severe, and in four the condition followed operative removal of hemorrhoids. In all but one both subjective and objective symptoms of the condition were entirely removed by X-ray applications and have remained so to date, and that one was greatly benefited and is still improving under treatment. The patients had no other treatment in connection with the X-ray, and as they had failed to respond to ordinary measures before it was applied the credit for the happy results can very justly be attributed to the use of this agent.

NOTES ON THE ETIOLOGY OF LUPUS AND ON CASES TREATED BY THE X-RAY AND FINSEN LIGHT.—F. H. Jacob.—London Lancet, Feb. 20, 1904. Out of 30 cases of lupus there was a history of phthisis in near relatives in 22. In three cases the lupus appeared while the patient was actually nursing a case of phthisis and in one while nursing a case of hip disease with a discharging sinus. In three cases lupus appeared in an infant whose parent was suffering from phthisis and in one case the father died a year previously from phthisis. One patient habitually used the same towel as her sister who was suffering from lupus. In two cases the disease arose on the wrist of a patient suffering from phthisis. In one case it arose from the margin of a wound left after excision of glands in the neck and in two cases it arose from the margin of a chronic abscess in the neck. In one case it occurred in the wound caused by a blow over the tibia. Thus in 15 cases the origin could be traced with tolerable certainty. In addition I may mention that six cases presented blocking of a nasal duct previously to the appearance of lupus, of which cases four were probed prior to the onset of the disease.

Dr. Jacob believes that the most efficacious routine treatment of lupus is X-Ray applications three times weekly of ten minutes' duration each, and that the curative result is hastened if a mild dermatitis is produced. For cases exhibiting special pathological features, modifications of technique are necessary; for instance, he treats deep nodules by placing a small drop of pure phenol on the top of the nodule with a wooden match stick;

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when the surface is anaesthetic he penetrates the nodule with a pointed stick dipped in pure carbolic acid, and when the deeper portions are also anaesthetic he rubs pure carbolic acid thoroughly into the nodule. While the tissue is still white from the action of the acid, he applies the Finsen lamp (London model) to the diseased area to the point of producing pretty severe reaction. Three or four applications establish a cure, but small pits are left.

Two cases of eczema of the palm of the hand presenting great thickening of the horny layer and deep bleeding cracks were cured by X-radiation, one in six months and the other in one. These cases had been in existence eight and seven years respectively. The diminished length of the treatment required in the second case is attributed to the fact that a dermatitis was induced.

Good results have been produced in ringworm. He endeavors to secure depilation without dermatitis and usually can accomplish it by giving two applications of half an hour each at intervals of a fortnight.

Particulars with regard to the X-Ray apparatus used are not given.

Society Meetings

MINUTES OF THE FEBRUARY MEETING OF THE CHICAGO ELECTRO-MEDICAL SOCIETY.

The society was called to order in room 412 Atlas Block, Dr. Burdick being in the chair. The minutes of the last meeting were read and approved. Under the heading of new business the President asked whether the society would rather hold its meetings in some other building owing to the poor elevator service during the evening. The society decided that the present rooms were to be preferred because of the electrical apparatus with which to illustrate any article.

Dr. May Cushman Rice's paper was then read. It was discussed by Drs. Burdick, Neiswanger, Coleman and Mr. Treadwell.

The society then adjourned.

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Current Electrology and Radiology

(Only articles relating to the above-named subjects will be abstracted.)

JOURNAL OF ADVANCED THERAPEUTICS.

New York, March, 1904.

1. A Plea for Electro-Therapeutics Proper.—W. J. Herdman, Ann Arbor, Mich. (*To be continued.*)

2. The Present Status of X-Ray Therapy in the Management of Cancer. C. E. Skinner, New Haven, Conn.

3. Report of the Committee of the American Electro-Therapeutic Association on Current Classification and Nomenclature.

4. Lobar Pneumonia a Secondary Disease, Preventable and Controllable by Physical and Dietetic Methods.—M. W. Brinkmann, New York.

5. A New System of "High Frequency" Therapeutics.—F. F. Strong, Boston.

6. On the Physio-Pathological Action of the High Frequency and High Tension Currents on the Normal Skin. Histological Researches.—G. Arienzo and S. Fabrozzi, Naples, Italy. (To be continued.)

1. This article will be abstracted when it is concluded.

2. Skinner divides malignant processes with reference to the efficiency of X-ray therapy into three primary groups—those affecting the layers of the true skin only, those affecting the deeper soft structures either with or without involvement of the integument, and those affecting the bones. The measure is efficient in the management of these different groups in the order in which they are named.

He believes the X-ray to be the best agent now available for the management of the first group from both the curative and cosmetic standpoints. Initial extirpation to be followed by X-ray applications to forestall recurrence is the method of election in the treatment of the second group, although X-ray applications may be used if operation is refused or considered

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inadvisable, with a fair degree of hope in many cases. He has only heard of one case where the X-ray alone is claimed to have cured a malignant process involving bony tissue, hence surgical procedures should always be employed as an initial step in the treatment of cases belonging in the third group. There is no satisfactory evidence available indicating that the X-ray provokes metastasis.

X-rays of high penetration excited by a static machine are recommended for treating deeply located growths, and rays of low penetration excited by either coil or static machine for superficial cases.

3. This report was presented at the annual convention of the A. E.-T. A. in September, 1903, and cannot well be abstracted. Copies may be had from Dr. C. E. Skinner of New Haven, Conn., secretary of the American Electro-Therapeutic Association, or Mr. W. J. Jenks, 120 Broadway, New York, chairman of the committee.

6. This article will be abstracted when concluded.

AMERICAN X-RAY JOURNAL.
Chicago, February, 1904.

1. Principles of Electro-Therapy.—H. Preston Pratt, Chicago.

2. The Medico-Legal Value of the Roentgen Rays.—Mihran K. Kassabian, Philadelphia.

3. Dangers to the X-Ray Operator.—John T. Pitkin, Buffalo, N. Y.

4. Static Currents.—The ninth of a course of twenty-four lessons in electro-therapy, given under the auspices of the Chicago College of X-Ray- and Electro-Therapeutics.

5. Suggestion in Its Relation to Electrical Applications.—C. G. Davis, Chicago.

1. Pratt gives a conveniently concise statement of the present status of scientific thought on the constitution of matter and its relation to so-called electricity. He quotes freely from the best authorities in physics who have given this subject special attention, notably of the recent writers, J. J. Thomson, Lodge and Rutherford. The writer also ventures some sug-

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gestions as following from his own work, but it is not easy to understand the application of these to the subject without a more detailed account of the methods employed.

It is to be hoped that Dr. Pratt will continue his work on oxygen and potassium and in a future article explain what the "Electroscopic and electromagnetic tests" were. At the end of the article is appended a list of elementary substances suggested by Thomson, stating in each case the probable number of electrons composing an atom.

2. Kassabian shows the usefulness of the skiagraph when taken into court, and that the judges of all courts in the eastern and middle states have permitted and even encouraged their use in damage suits. The correctly produced skiagraph is reliable and when produced must be correctly interpreted. He believes that the radiograph should be taken by a physician and one who has had considerable experience, mentioning as illustrating this point a case in which he was able to prove that the opposing party had mistaken the shadow of a spinous process for the shadow of a callus. All fractures should be examined with the X-ray, so that the cases can be treated intelligently. A record should be kept of the details, such as the time of exposure, distance of the Crookes tube from the plate and position of the tube and the part, and the negatives should be numbered.

3. This article was published in this journal, issues of December, 1903, and January, 1904.

4. The different currents derivable from the static machine are named and described.

5. Davis believes that the beneficial effects of all remedial measures, electricity included, are effected largely through psychic influences. He says:

"Time and again I have known a patient to rise from an electric application when the battery had become suddenly out of order and there was no current at all, stating that he felt a wonderful improvement from the treatment.

"I have seen warts and other growths removed by the X-ray. So have I many times seen the same thing done by a village

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conjurer. So I repeat again, there is no therapeutic agent in present use so liable to act in a suggestive way [as electricity.—Ed.].

"The ponderous machinery in the electrician's office, the thought of chain lightning, the sharp flash of the spark, the wonderful violet spray from the static machine and the marvelous X-ray all have a tendency to excite faith, hope and expectancy. But suggestion is legitimate, it is justifiable; only as scientists let us not be confused."

JOURNAL DE PHYSIOTHERAPIE.

Paris, February, 1904.

1. The Influence of the X-Ray upon Animal Tissues.—By MM. R. Lepine et Boulud.

2. Concerning Varicosis.—By Dr. Gensier.

3. Bodily Exercise During Disease.—Professeur J. Zabludowski.

1. This paper was read before the Academy of Sciences January 11, 1904. The experiments were to ascertain the effect of X-ray exposures upon, first, the diastasic ferment of the pancreas; second, glycogen and the sugar of the liver; third, glycolytic (and glycogenic) power of the blood. Experiment 1—Pancreas of dog which had fasted for sixteen hours was minced and a portion exposed to X-rays excited by a coil which was using six amperes of current. Another portion of same weight was left in the same room, temperature 20° C., but not exposed to the rays. After one hour both were placed in separate flasks containing 100 cc. of 1 per cent starch solution and a little thymol, and left in thermostat for four hours. This experiment was repeated nine times. It was found that the portion that was exposed to the X-rays exhibited an average increase of 12 per cent in diastasic power over that which had not been exposed. Experiment 2—Liver of a dog which had been bled to death was treated as in experiment one. Two portions were used. One was exposed for one-half hour, the other for one hour, and then both were submerged in trichloracetic acid and tested for glycogen and sugar. Short exposure

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gave more glycogen and more sugar, while the sum of the glycogen and sugar was less than that present in control experiment. In that portion which had been subjected to the long exposure there was found more glycogen and more sugar. The short exposure therefore is the more efficacious in stimulating glycolytic action. Experiment 3—Blood was collected in an aseptic manner and defibrinated: experiment carried on same as in foregoing; exposures were 15 and 60 minutes respectively. Short exposure gave marked decrease in sugar; long exposure generally gave more sugar. The short exposure was found to be capable of completely inhibiting the glycolytic action.

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Archives of Electrology and Radiology

Vol. IV April, 1904 No. 4

Original Contributions.

THE TREND OF MODERN THOUGHT ON THE SUB-ATOMIC STRUCTURE OF MATTER.*

By Arthur W. Goodspeed, Ph. D.,

Randal Morgan Laboratory of Physics, University of Pennsylvania, President of the American Roentgen Ray Society, etc.

(*Concluded from last issue.*)

Until rather recent years physics was said to treat of masses and of molecules and their energy relations, while chemistry investigated molecules and atoms and their energy relations. More recently physics and chemistry together, aided by that ever-powerful ally mathematics, have strenuously attacked the atom, hoping through this doorway—narrow, it is true, but manifold—to flash now and then a ray of light illuminating for a moment, if but dimly, the mysteries beyond.

The advances in physical science during the last century have been many and rapid, yet made with such care, each new discovery or generalization being criticised so severely and impartially, that what has stood all tests and finally been generally accepted forms a most stable and reliant structure to which very recently the trial framework of another story has been erected.

From the various experiments described by Crookes in 1879, he was convinced that the residual gas in a very high vacuum under the action of an electric discharge presents properties so

*Presidential address delivered at the Fourth Annual Meeting of the American Roentgen Ray Society, at Philadelphia, Penn., December 9th, 1903.

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different from those of ordinary gas as to warrant the application of the title "radiant matter," to what we now usually call cathode rays or Crookes rays. Crookes himself insisted that the cathode rays must consist of rectilinear streams of negatively electrified molecules projected with high speed from the cathode. The beautiful mechanical devices which he invented to demonstrate the probability of this view are quite familiar and it is not necessary to describe them here. Although Crookes' conclusions were not then accepted by everybody, later developments have shown them to be in the main correct, except as to the magnitude of the bodies concerned.

In 1895 Perrin proved this by actual experiment, and later also J. J. Thomson by a different method.

By a simple though ingenious line of reasoning, based upon well-known principles of dynamics, Thomson was able to measure the speed, the mass and the electric charge of these little bodies. It had been shown by Crookes that the cathode stream is easily deviated both by a magnetic field and by an electrical one. If the direction of the magnetic field be perpendicular to the motion, the deviating force is $H\ e\ v$, in which H is the intensity of the field, e the charge in each body and v the speed. But under these conditions the paths of the particles are circular, as would result from a central force $\frac{m\ v^2}{r}$ m being the mass of each particle and r the radius of the circular orbit. Equating the above, it follows that $\left(\frac{e}{m}\right) = \frac{v}{H\ r}$

Now H and r can be measured by obvious methods, but the value of v had to be obtained in order to calculate the value of the ratio of charge to mass. This was done by Thomson by introducing an electrical field perpendicular to both the direction of motion and to the magnetic field. The strength of this electrical field was so adjusted as to straighten again the circular paths of the particles. This gave the equation,

$$F e = H e\ v \text{ or } v = \frac{F}{H}$$

In Thomson's experiments the values obtained for v were

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between 2.2 and 3.6 times 10^9 c. m. per second, or about one-tenth that of light.

v depends somewhat on the degree of exhaustion on account of the interference of intermediate impacts. The value of $(\frac{e}{m})$ from these data is about 10^7 C. G. S. units, or the mass required to carry a unit of electricity is 10^{-7} of a gram. As the value of $(\frac{e}{m})$ is found to be independent of the kind of gas filling the tube before exhaustion, and also of the substance of the electrodes, one is forced to the conclusion that these little carriers, or "corpuscles" as Thomson calls them, must be quite a strange form of matter and not at all identical with either a molecule or an atom, though forming a part, always the same in kind, of atoms of all kinds.

Since it has been shown that the charge on a particle in gas electrolysis has the same value as that conveyed by a hydrogen atom in liquid electrolysis—viz., 1.13×10^{-20} E. M. U.; and since 10^{-4} of a gram of hydrogen carries a unit charge in liquid electrolysis, it follows that each corpuscle must have a mass equal to 10^{-3} of that of a hydrogen atom, or about 2.3×10^{-27} of a gram. In other words, the atom of the chemist and of the physicist, conceived of 2,400 years ago by Demokritus and Leukippus, and glorified, as Tait puts it, in the grand poem of Leucretius; of the chemist as the smallest portion of matter capable of forming part of a compound substance, of the physicist as the smallest part that can receive or give an impulse or take part in an energy change, has been shown in the last decade or less to be 1,000 times more massive than a "corpuscle," and this, too, though we choose the least atom known, that of hydrogen.

Lenard in 1893 was able to get the cathode rays outside the vacuum tube through a very small aluminum window. He thereby studied their properties, which have since become well known.

Three years later Roentgen discovered other rays, the prop-

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erties and effects of which have been studied ever since all over the world and which have become of vital importance in more than one department of science. Everybody present is more or less familiar with these rays and I have no intention before this audience certainly of telling the oft-told story. "What are they?" as well as, "What do they?" should be the question of the physicist. They differ from cathode rays in not being easily deviable by either a magnetic or by an electrical field. They are unlike light rays in not being susceptible either of reflection, refraction or polarization within the usual meanings of these terms.

Other rays having some properties in common with those of the cathode rays and the Roentgen rays were discovered in 1896 by Becquerel to be given off by the double salt of uranium and potassium. These uranium emanations have excited much interest ever since and been carefully studied by Becquerel and others with many startling results.

In 1898 Mme. Curie, having taken up the study of the various salts of uranium, and then of the various minerals containing uranium, announced through Prof. Becquerel her results. Her first important conclusions were that the salts were active in proportion to the uranium in them, but that the minerals were not so.

For example, uraninite, or pitchblend as it is called, was found to be several times as active as metallic uranium itself; hence uranium cannot be the chief agent in the production of the emanations.

After a long and most careful chemical research Mme. Curie, assisted by her husband, separated from a very large amount of uraninite a very small quantity of an active substance similar to bismuth, which seemed to be a new element. They called this polonium, from Poland, their native country.

Continuing their work with vigor, the Curies soon announced the separation of still another elementary substance from uraninite with a radio-activity 10^6 times as great as that from metallic uranium. This was called radium. The rapidly increasing popular as well as scientific interest in this wonderful

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substance would justify the time and space necessary to relate some of its properties, even if it did not furnish a very suitable example for illustrating the latest theory of matter to be spoken of presently. The quantity obtainable from uraninite, so far the most fruitful source, is exceedingly small. It is estimated that to obtain a single pound, and that not pure, would require the working of 5,000 tons of the mineral. Chemically radium is closely allied to barium.

A third radio-active substance which was allied to iron was discovered by Debierne in 1899; this he called actinium. The status of actinium as an element I believe is questioned. The emanations from all these substances are similar, and the superb research work of the Curies, J. J. Thomson, Rutherford, Crookes, Kaufmann, and many others probably, whose names should with equal justice be mentioned, has resulted in much new science and in throwing some light on the mysterious problems yet to be solved.

Without going at all into the details of the methods of investigation, let me say briefly that it is found that the emanations from radium are of three kinds. Rutherford designates them, first, α-rays, positively electrified particles, very feebly penetrating and only very slightly deviable in the strongest fields and having a mass of the same order of magnitude as that of an atom; second, β-rays, identical with the Crookes or cathode rays—i. e., negatively charged particles, to which he gives the special name "corpuscles," somewhat penetrating, deflectable by both a magnetic and an electrical field; third, γ-rays, identical with the Roentgen rays, very penetrating and practically non-deviable.

I purpose now briefly to outline the electrical theory of matter and to show how it may be interpreted to explain not only many of the long known facts, but also some of the recently discovered phenomena the nature and cause of which have not been agreed upon.

If a body of mass m move with a speed v, its kinetic energy is given by the simple formula,

$$E_k = \tfrac{1}{2}\, m\, v^2.$$

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This, of course, is equal to the work required to give the mass m the speed v. If now the body, assumed spherical for simplicity, have an electrical charge, a magnetic field is produced simultaneously with the motion and more work will be required to produce the same speed in m. It can be proved mathematically that this *extra* work required to produce the magnetic field is

$$\frac{1}{3}\frac{e^2}{a}v^2$$

in which e is the charge, a the radius of the moving sphere and v the speed.

Adding the magnetic energy thus developed in the aether to the mass energy, the total becomes,

$$E = \frac{1}{2}\left\{m + \frac{2}{3}\frac{e^2}{a}\right\}v^2$$

in which the quantity in brackets becomes the effective mass or the real inertia of the combination, and $\frac{2}{3}\frac{e^2}{a}$ the electric inertia. Now as the sphere when charged controls more energy than when not charged, the aether must have supplied the extra, and be ready to absorb it as the body comes to rest.

Now let us take quite another attitude and adopt Faraday's conception of tubes of force and endow these tubes with momentum. Assuming again the same conditions, we can prove mathematically that the electric momentum due to the moving charge e would be

$$\frac{2}{3}\frac{e^2}{a}v,$$

which gives the same value as before for the electric inertia, viz., $\frac{2}{3}\frac{e^2}{a}$.

Mental help would be derived in thinking of these phenomena by noting the sensation experienced in pulling a body through a limpid liquid like water. Mathematical analysis proves that the apparent mass of a sphere is increased by one-half the

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liquid mass displaced. We use mass always in the sense of inertia. This effect is independent of direction of the motion because of the symmetry of the spherical form. If, however, a long cylinder be propelled in a liquid the external inertia will clearly be a function of the direction of the motion relative to the longest or shortest dimensions of the cylinder. If the motion be parallel to the axis of the cylinder, a small liquid displacement per unit distance of motion will result; while if the movement be at right angles to the axis, the maximum external inertia is experienced. Further, if an *infinite* cylinder in a liquid (e. g., a tube of force in the aether) be moved in any direction (except longitudinally, which means that it is not moved at all), it has external momentum only at right angles to its length. The energy of a tube we conceive as belonging to the body from which the tube originates, the inertia being due to the grip of these force tubes on the aether (to use an expression of J. J. Thomson).

In the discussion resulting in the conclusion that the electrical mass of a charged body in motion is proportional to $\frac{e^2}{a}$ the speed was supposed small in comparison to that of aether wave-motion.

In the case of a corpuscle having a velocity of the same order of magnitude as that of light a further analysis is necessary. In this case the electrical mass will depend on the speed. A contemplation of Doeppler's principle will make this evident, since as the charge changes position there is a continuous though not instantaneous readjustment of the lines of force which would radiate in all directions in straight paths if the charge were at rest. When the speed of the charged sphere has reached that of aether wave-motion, the force tubes would all be equatorial and the mass infinite.

If, then, it could be shown *experimentally* that the effective mass of a moving charged body is dependent on its speed, a part at least of this mass would have to be electrical, and due to this force-tube inertia. The experimental test of the ques-

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tion was made by Kaufmann when he measured the ratio $\left(\frac{e}{m}\right)$ in the case of the negative carriers (i. e., the β-rays) from radium. These rays have a higher average speed than cathode rays and in Kaufmann's experiments rays of different speeds were measured. The ratio $\left(\frac{e}{m}\right)$ varied from $(1.31 \text{ to } 0.63) \times 10^7$ according to the speed of the corpuscles.

Now Thomson, in his "Recent Researches," develops a formula for the electrical momentum of a charged body without any limitation to the speed:

$$I = \frac{e^2}{2a} \frac{V^2}{V\sqrt{V^2-v^2}} \left\{ \theta\left(1-\frac{1}{4}\frac{V^2}{v^2}-\frac{1}{2}\sin 2\theta \left(1+\frac{1}{4}\frac{V^2}{v^2}\cos 2\theta\right)\right)\right\}$$

in which V is the velocity of aether wave-motion—i. e., that of light.

This easily reduces to $\frac{2}{3}\frac{e^2}{a}v$, the value obtained before, when v is small compared with V; while if $v = V$, I becomes infinite.

Referring now to Kaufmann's experimental results mentioned above, attention is directed to the following table:

I. v.	II. $\left(\frac{e}{m}\right)$	III. $\frac{m}{m}$ (Exp.)	IV. $\frac{m}{m}$ (theory)
2.36×10^{10}	1.31×10^7	1.50	1.65
2.48 "	1.17 "	1.66	1.83
2.59 "	0.97 "	2.00	2.04
2.72 "	0.77 "	2.42	2.43
2.83 "	0.63 "	3.10	3.09

Column I gives five speed values actually measured of β-rays from radium. Column II gives the corresponding e/m for each experiment. Column III gives the five respective values calculated from the results of experiment, of the ratio of the mass of radium corpuscles to that of cathode ray corpuscles. For these latter particles $\left(\frac{e}{m}\right) = 1.95 \times 10^7$, the speed being

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less, the charges being of course the same. In column IV are found the ratios of the same masses calculated from the theoretical formula by substituting the different values of v given in column I. Attention is called to the very close agreement between columns III and IV, and also to the very weighty evidence thereby offered that the total mass of a moving corpuscle is electrical. It is surely worthy of note, too, that the agreement is closer for the higher speeds; which farther strengthens one's belief in the theory that all mass is electrical.

Consider now the effect of such impact of these particles or corpuscles as occurs in a Crookes tube. According to our theory each corpuscle is accompanied by lines of force having inertia. Because of this inertia the parts of lines at a distance from the corpuscles do not participate at once in the effect of the impact, since this effect has to travel along each line outward from each particle with the speed of aether wave-motion. The conclusion is that these radiating pulses constitute the Roentgen rays, and the results of some recent researches of Blondlot for the purpose of measuring the speed of propagation of these rays are consistent with this view. Blondlot seems to have shown by experiment that the Roentgen rays travel with the speed of light.

Since it has been proved by experiment almost beyond question that the corpuscular carriers of negative electricity are always of the same mass from whatever source derived, the idea is at once suggested that these bodies may be the units from which all kinds of atoms are formed, this unit of building material being the same in all substances. The following crude illustration may help to make this idea conceivable: For example, a whole city (a molecule) or group of cities (a mass) might be composed of separate buildings (the atoms), either all alike (an element) or of many shapes and sizes (a compound), while every building might be made of bricks (the corpuscules) exactly alike in every respect. This notion that all matter in its simplest state is of only a single kind is, of

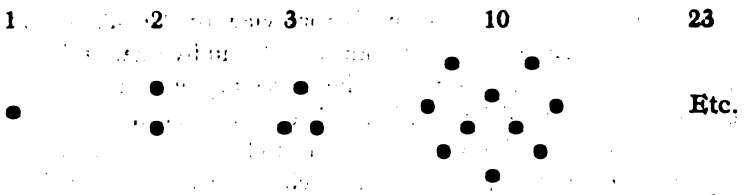
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course, not new, though the very forcible experimental evidence indicating such a state of affairs has been offered within a comparatively few months. While it may be urged that another step has indeed been taken but only deeper into the mystery, yet assuming the truth of the above conclusion, we find ourselves now face to face with a *single* problem instead of many, the solution of which would open wide the door to a comprehensive knowledge of many things now unknown and formerly unknowable.

If we assume that a volume of the jelly-like aether—very large compared to a corpuscle—is surrounding a group of corpuscles, the latter filling this space with lines of force mutually repellent, but all gripping the aether, we shall have a structure behaving dynamically just like a uniform sphere of positive electricity, throughout which are scattered particles of negative electricity or corpuscles. The spherical positive body will exert a force on each negative electron directed towards the center of the space and in magnitude proportional to the distance from the center directly; while each pair of negative bodies will mutually repel with a force inversely proportional to the square of the distance between them.

Because of these two kinds of action, it occurs to one at once that combinations differing both in number and in configuration must also be unlike in their stability of permanent identity. Suppose we consider the conditions of equilibrium for different numbers of corpuscles. If the number be small enough the problem can be solved easily; e. g., in the case of three, the arrangement will be in the form of an equilateral triangle; of four, in a square or a regular tatrahedron. For larger numbers the forms that result can best be determined and studied by experiment. As a suggestion of how this might be possible, suppose a number of magnets floating vertically in a liquid, similar poles up. Above this system with an opposite pole directed downward, station another magnet; the following plane figures will be formed by the floating poles depending on the number:

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As the number increases it appears that the arrangement developes into a series of concentric symmetrical forms, the innermost one developing from a single unit. For example, the triangular formation occurs first with three units; next with ten; then again with twenty-three, two rows encompassing the three-part center, and so on for larger numbers.

This is suggestive of the recurrence of definite chemical properties periodically when the elements are arranged in the sequence of their atomic mass values, since it would be most reasonable that the properties of a substance should depend, in part at least, on the configuration as well as on the number of its atomic units. This theory also indicates a possible relation and its cause, between the different spectrum lines of an element, as well as that between the spectra of allied elements.

Consider the vibrations in the case of a simple form, e. g., the triangular arrangement. As each corpuscle has three degrees of freedom of motion there could be as many as nine periods of vibration, though probably not so many would actually occur, as they would not likely all be different; so the spectrum might consist of a number of lines up to nine as a maximum. Again, in the next occurrence of the trio, there will be ten corpuscles in all, seven around the triangle. By influence of the seven, the periods of the inner three would be somewhat changed, and those that were equal when the grouping consisted of the triangle alone must now be slightly different because of the dynamical asymmetry of the system, giving rise therefore to double or triple groups of lines. A higher complexity of the structure, which implies a greater atomic mass, would result in more complex spectrum groups—as, for example, greater and different spaces between the components of different lines.

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Any theory suggesting a satisfactory view of the sub-atomic structure of matter must account for the individual stability of the atom. If we consider the necessary expenditure of energy for atomic disintegration, it is evident that in some way it must depend on the number of corpuscles, and on the value of their corresponding charges, as well as on the mean radius of the whole system. That is:

$$\text{atomic energy} = \phi(n)\frac{e^2}{a},$$

in which e is the charge on each of n corpuscles assembled into a group of average radius a. If r be taken as the radius of one neutral unit composed of a negative corpuscle embeded in its complementary positive electricity, then $nr^3=a^3$, and the above energy formula becomes:

$$\text{atomic energy} = \phi(n)\frac{e^2}{n^{\frac{1}{3}}r},$$

Now the obvious condition that this atom shall not split up into two is that:

$$\frac{\phi(n)}{n^{\frac{1}{3}}} < \frac{\phi(n_1)}{n_1^{\frac{1}{3}}} + \frac{\phi(n_2)}{n_2^{\frac{1}{3}}},$$

in which n_1 and n_2 would be the number of units in each part, n_1+n_2 being equal to n. If $\phi(n)$ is proportional to a power of n less than the three-fourths power, this unequality will not be satisfied for any value of n, and an atom coming into that dynamic state from any cause, would be unstable and break up, the neutral units redistributing themselves according to the new conditions, so that the dependence of energy on the number of units would be according to a power of n large enough to have the above condition satisfied. Again, it is possible that for higher values of n the test of stability would indicate the existance of an atom to be impossible; where for values of n near the limit the atoms would be on the verge of being unstable.

Just in this connection attention is called to the fact that radio-active substances, such as radium, thorium, uranium, have the greatest atomic masses known, i. e., they are on the

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border line of stability. In fact, as already stated, it is certain that radium emits positive emanations, the mass of which, Rutherford finds by measuring $\left(\frac{e}{m}\right)$ is of the same order of magnitude as the atomic mass—strong evidence surely that the atom has divided. As it is probable that atomic stability depends on external influences, it is possible that some of the elements familiar to us now could not have existed at an earlier period of the earth's history because of such wide differences in such conditions as temperature, pressure, etc. Again, possibly others might easily have been stable under former conditions, but are not so now, and have been going out of existence for a million years or so—the present age, with its ultra refined methods for investigation being just in time and prepared to catch a few milligrams of the last traces of such as radium and polonium. Startling, indeed, would it be if the newspaper reports of the last few days that Ramsay has actually turned radium into helium should prove true!

Some other recognized atomic properties may be simply explained on the electric theory of matter. Consider an atom which just before coming into its present state lost a negative electron because its internal kinetic energy was a little too great to be consistent with its gradually changed surroundings, and the most active corpuscle escaped. This leaves the atom positively charged and stable since the next most active corpuscle will not be able to get away because of the now increased positive attraction. In this state the atom would be a monovalent positive atom. Others might naturally be so internally active as to require the escape of two or three corpuscles to render them stable, resulting in a bivalent or a trivalent atom. Again, others might be so stable as to be able to acquire one to three corpuscles without becoming unstable; these would be electro-negative atoms. Suppose we consider an atom of hydrogen. It is just unstable enough to have to emit one corpuscle, say (of its thousand) to become stable, and thereby positively charged. A nearby chlorine atom is so

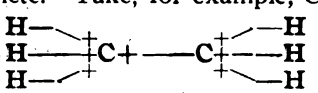
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stable as to be able to take one corpuscle without becoming unstable, and so it will become negatively charged on receiving the corpuscle expelled from the hydrogen atom, and the H and the Cl will unite to form a molecule of HCl. If oxygen, instead of chlorine, be present, it is so stable as to be able easily to absorb two corpuscles, and we find it attracting the superabundance of two atoms of hydrogen and a molecule of water is formed.

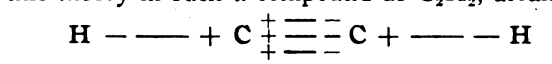
Valency would then obviously depend on external conditions, a conclusion long since arrived at by chemists from other considerations.

To account for the combination of atoms of the same substance to form a molecule, suppose, as is quite reasonable, that for a given number of corpuscular units of positive and negative electricity, the stability is a function of the atomic speed, the intensity of impact, or depends on the surrounding medium perhaps. The average kinetic energy of the whole may stay constant while that of single units differs at any instant widely from that of certain other ones. At any particular instant then, some units will be unstable and others ultra-stable, and pairing off will result as before. Dissociation of molecules accompanying high temperature is explained on the electric theory by assuming the negatively charged atom to lose some corpuscles, leaving it positive and so repelled by its mate already positive.

The chemist will at once picture our unit force tubes as his diagramatic bonds and the analogy is good, though the identity is not quite complete. Take, for example, C_2H_6, arranged:



It will be seen that the two carbon atoms are structurally different, one having less and the other more corpuscles than average. A greater difference in the carbon atoms must result from this theory in such a compound as C_2H_2, arranged:



From the evidence set forth in the foregoing pages, both direct and indirect, the thoughtful reader can but feel that, possibly, even probably, *electricity* and the *aether*, not so long ago omitted from both of the great classes of objectivities, may yet be shown to be one and the same thing, and that this is the *only* objectivity in the physical world.

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THE THERAPEUTIC EFFECTS OF THE X-RAYS. AS SHOWN FROM THE RESULTS OF TREATMENT OF NEARLY ONE HUNDRED CASES.*

By Henry K. Pancoast, M. D.,
of Philadelphia, Pa.

(*Continued from last issue.*)

Case No. 1. Multiple epithelioma involving the upper lip, nose and forehead. She was admitted to the hospital June 22, 1902. The first picture (Fig. 1) was taken two weeks afterward, and shows the condition very well. The second picture (Fig. 2) was taken about nine weeks following admission, after 32 treatments, and shows a tremendous spread of the growth over the upper lip and complete destruction of the tip of the nose. After 14 more treatments and curettement, the lip was almost completely destroyed, and the patient presented a horrible appearance, of which we have no photograph. She wished then to return home and die, rather than run the risk of further deformity away from her family. It still seems probable that after complete destruction of this area we could obtain healing, but with entire loss of the upper lip and lower half of the nose. We were able to bring about almost complete healing in the areas on the forehead and upper part of the nose. This patient, barring some intervals, was treated from three to six times a week. We might conclude that the X-rays were, *per se,* powerless to check the spread of the growth, or that the technique was faulty, but there was certainly no chance of obtaining a cosmetic result with restoration of tissue. There was surely some stimulation offered toward more rapid progress of the growth. The treatment gave the patient no relief from pain, and, in fact, increased it from the start. After each application there was an almost immediate exacerbation of pain, which was still worse on the day following.

Case II. Large epithelioma of the left temporal region. This patient began treatment July 7, 1903, and since then has had 73 applications. There has not been any improvement in

*Read at the Fourth Annual Meeting of the American Roentgen Ray Society, at Philadelphia, Pa., December 10th, 1903.

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his condition, and the growth is slowly but surely spreading. The photographs (Figs. 3-4-5) were taken July 16th, Sept. 5th and November 29th respectively. Now that there are so many reports about the use of radium in the treatment of cancer and lupus, we have given it a trial in this case for the past week or ten days. In this particular case, five applications of radium have been substituted in the place of X-rays and lasting 10 to 15 minutes each. Our specimen is the bromide salt of 7,000 radio-activity. This patient was informed of the fact that radium was being used, of the marvelous reports of cures made by it, and of its cost. He imagines he is improving, although such is really not the case. I am extremely skeptical in regard to the favorable results obtained by the therapeutic use of radium and am sure that many of the reported improvements are purely psychic in nature, as it was in this case. Some recent articles written upon the subject in this country, have bordered on the ridiculous. Had our patient not been informed as to the nature of the substance being used, he would not have noticed any improvement in his condition.

Case III. Large metastatic epitheliomatous mass on the back of the neck and the sub-maxillary region. This patient presents a horrible appearance and is one in which the X-Ray could do no good whatever. He died after four treatments. This growth was secondary to a small epithelioma of the lower lip removed about two years before by cancer plasters, and the case serves well to illustrate the danger of treating epithelioma of this region by such slow methods as the X-Ray. The photograph is here shown. (Fig. 6.)

Case IV. A recurrent epithelioma of the superior maxilla. This is the third recurrence following operation upon the primary growth, and this tumor has extended into the orbital cavity with protrusion of the eye, into the frontal sinuses, and probably into the cranial cavity. When first seen there was considerable ulceration of the tumor mass below the eye. This ulceration healed very nicely under treatment with the ray, but the upper part of the tumor continued to grow steadily and the patient died. About 60 applications in all were given.

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There was at first a decided relief from pain, but later on, morphin was required. A photograph (Fig. 7) was taken not long before the termination of the treatment.

Case V. A metastatic epitheliomatous growth of the glands of the left side of the neck following a primary lesion on the tongue, for which half of that organ was removed nearly a year ago. The patient began treatment Sept. 8, 1903, and until November 3, received 44 applications of the X-rays of 5 to 10 minutes' duration each, outside upon the neck, and seven treatments inside the mouth (to prevent local recurrence). About this latter date a slight burn appeared over this area in the neck. The length of the treatments was then shortened to three or four minutes, fifteen such exposures being made up to November 20th. Then the burn reappeared and was of the second degree, but soon yielded to zinc ointment. After seven more sittings, treatment by radium was begun over the area in the neck, and up to to-day eight applications of ten minutes' each have been made, the X-ray having been stopped. The burn is entirely healed. The photograph (Fig. 8) was taken when the radium treatment was started. The reason for this change was the fact that the X-ray seemed to have little or no power to control the growth. Whatever pain the patient had before has been relieved, however, and much of the apparent stiffness in the muscles of the neck, and very likely the rapidity of growth in the glands has been retarded to some extent, and life prolonged, but a cure does not seem in any way possible The burn in this case, like all others we have had so far during the treatment of cases, healed rapidly. It does not seem necessary that burns should cause any anxiety as long as they are carefully watched and cared for. But only those physicians or surgeons familiar with X-ray burns and their treatment should be the ones to look after these peculiar lesions.

Case VI. A patient suffering from a large protruding recurrent carcinoma of the rectum following a Kraske operation for removal of the primary growth. The case was a hopeless one, and treatment was given with the hope that it might possibly prove to be one of those rare cases that once in a while.

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startle us by being reported as cured and gives world-wide publicity. Then, too, the comfort of the patient was to be taken into consideration. The first application was made July 7, 1903, and until October 18, twenty-one treatments of about ten minutes' duration were given anteriorly through the abdominal wall and twenty posteriorly over the anal and sacral regions. He was not in a condition to be treated again until November 20th and from then until the 29th four more applications were made, and then radium was tried, it having been used five times so far, ten minutes each time. The photograph (Fig. 9) was taken November 23d of the anal region, showing the protruding mass.

Case VII. This patient is still another in whom no results have been obtained by X-ray treatment and none are seriously looked for. After an operation in January, 1903, for removal of the left breast for carcinoma, she was sent to us for treatment June 25th for a recurrence in the supra and infra-clavicular and axillary regions, with marked oedema of the arm. Until December 3rd, 48 applications were made of about 10 minutes each. Such treatment is by all means too mild, but the patient is the person to blame for this as she was very irregular in her attendance. The growth has been steadily progressing. The photograph (Fig. 10) shows the condition at this time.

Case VIII. No case can be mentioned as a more horrible example of the ravages of carcinoma nor of the futility of the X-ray to accomplish any result than does this one. The patient had previously had the right breast and usual structures removed for carcinoma, and was referred June 6, 1903, for X-ray treatment of metastatic lesions in the lymphatic glands and channels in all directions, and also in the opposite breast. This patient's welfare was most faithfully observed and eighty-two treatments were given until September 18, this being almost daily. Our greatest hope was, of course, to cure such a case, and particularly as the patient gave us every help she could. But who in his inner conscience could expect such a case to get well? There is no doubt but that we held the disease somewhat in check, relieved much of the pain, for a long

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time rendered opiates unnecessary, and really prolonged life. This latter result we know to have been well worth our efforts. In order to attend to important family matters the patient returned home, promising faithfully to reappear in ten days. As was to be expected, she came back in one month and gave every appearance of a good example of the dangers resulting from stopping X-ray treatment before the disease is actually and absolutely cured. This applies to any condition for which the X-rays are being used in treatment. During the first two weeks of her absence the patient remained in about the same condition as when she left, but from that time until her return the growths took a fresh start and she said she "could fairly see them grow." When she again presented herself for treatment everything was worse in appearance than ever, and there were also evident signs of mediastinal metastasis. Metastatic growths in the mediastinum carry off our breast cases invariably, and serve as examples to throw a rope around the neck of any man who would advise X-ray treatment for primary cancer of the breast in preference to operation. This patient survived long enough to receive 14 more applications and then died. We have the satisfaction of having given her more relief and happiness in the last few weeks of her life than even morphin could have yielded.

The foregoing cases are but a few of the many examples of the class of patients they are intended to represent and serve to bring out the points of importance. There is no argument to oppose these facts, for no man of any experience has any other results to offer. Literature abounds in brilliant results following X-ray treatment, but are these reports of any real importance to mankind in general, and do they accomplish much more than to bring the writer into prominence? We want facts!

Medical literature is crowded with reports in which patients have been exposed to the X-Rays with more or less benefit, or none whatever, and have discontinued treatment after a certain length of time, and such experiences have shown that the patients are made unfortunates by having their lives shortened, as the disease invariably takes on a more rapid growth.

(*To be concluded.*)

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Editorial.

THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

One of the most potent factors in the dissemination of knowledge relating to the management of disease to-day is the society organized for the study of a special subject. A distinguished foreigner once said, "Whenever three Americans meet, they organize," and it is largely through this fondness for organization that the American people have acquired the industrial, political and scientific prominence which they enjoy to-day.

There are several reasons why the convention of the special society is potent in the promulgation of knowledge, but the two more important as are as follow:

First, when a man is to read a paper before a body of his peers he will be more careful to state nothing but facts that are susceptible of demonstration, because he realizes that a discussion is to follow, during which he will be called to account for any undue soaring into the realms of fancy; second, any undue mental bias into which an observer may have been thrown by his own personal experiences will be pretty likely to be corrected by the experiences of others who take part in the discussion. In the special societies the proportion of men who possess extensive knowledge of the subjects treated is larger than in the general societies, hence the process of sifting the reliable from the unreliable is much more vigorous and efficient.

In the particular field covered by the Archives of Electrology and Radiology, there are in this country at the present time three national bodies; the American Electro-Therapeutic Association, the American Roentgen Ray Society, and the National Society of Electro-Therapeutists. Several European

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countries have also organized national electro-therapeutic societies, but the American Electro-Therapeutic Association is the oldest institution of the sort in the world, having been organized in 1891. The association has held regular annual conventions of three days' duration each in different cities since its organization, the last of which took place at Atlantic City, N. J., in September, 1903. The papers presented at these conventions have never been less than twenty-six and have several times reached forty in number, and have covered exhaustively all the fields of therapeutics in which electricity plays a part either directly or indirectly.

The constitution of the association states that its object is "The cultivation and promotion of knowledge in whatever relates to the application of electricity in medicine and surgery," hence the various forms of radiant energy, the X-ray, the electric-light, radium and the various radio-active bodies come legitimately within its scope of study and much attention has been given to these subjects on the annual programs. At the 1903 convention there was a most interesting communication upon radium with an exhibition of specimens. The institution numbers among its members a large majority of the brightest lights in the electro-therapeutical world, and the transactions form an exhaustive epitome of the progress of electro- and radio-therapy during the past thirteen years.

At the 1903 convention several important steps conducive to the future growth and active usefulness of the institution were taken, prominent among them being the following:

First. It was voted that the admission fee shall be dropped, so that the five dollars which accompanies the application for membership and constitutes the first year's dues, shall be the only expenditure required of a newly-elected member.

Second. It was voted that the by-laws be suspended so that the executive council be empowered to elect candidates to full fellowship immediately after investigation as to eligibility. By reason of this provision applicants can be admitted to the privileges of membership within thirty days after the receipt

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of their applications, instead of having to wait until the next annual convention, as was formerly the case.

Third. It was voted to issue to those in good standing in the association, and to all who become members in the future, a certificate of membership of a size and character suitable for framing.

Fourth. It was voted to have manufacturers' exhibits of electro- and radio-therapeutical armamentaria at future conventions, and to make them a prominent feature of the program.

The next (fourteenth) annual convention will be held at St. Louis, Mo., on Tuesday, Wednesday, Thursday, and Friday, September 13th, 14th, 15th and 16th, 1904. The scientific sessions will be held only in the mornings, whereby the members will be afforded an opportunity of visiting the various attractions of the exposition during the afternoons.

The activity and practical usefulness of the association in the past is evidenced by the fact that the name of some member has been more or less intimately connected with nearly every electro-therapeutical discovery or development that has transpired during the last twenty years.

The officers for 1903-4 are: Dr. A. D. Rockwell of New York, president; Dr. W. P. Spring of Minneapolis, Minn., first vice-president; Dr. W. W. Eaton of Danvers, Mass., second vice-president; Dr. R. J. Nunn of Savannah, Ga., treasurer, and Dr. C. E. Skinner of New Haven, Conn., secretary. The members of the executive council are: Dr. Ernest Wende of Buffalo, N. Y.; Dr. F. B. Bishop of Washington, D. C.; Dr. C. O. Files of Portland, Me.; Dr. F. H. Morse of Melrose, Mass.; Dr. D. R. Brower of Chicago, Ill., and Dr. T. D. Crothers of Hartford, Conn.



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Miscellaneous Abstracts.

HYDROTHERAPY, ELECTRICITY AND MASSAGE IN THE TREATMENT OF DISEASES OF CHILDREN.

Herman B. Sheffield, The Post-Graduate, February, 1904.

The following general rules for the application of electricity to children are recommended:

1. Always administer the weakest possible current that will cause muscular contraction.

2. Never employ electricity in the inflammatory stage of organic disease.

3. In applying electricity to muscles always endeavor to separately reach the electromotor points. In deep-seated muscles the current should be applied along the course of the nerves supplying them.

4. Each electric treatment should last no longer than twenty minutes, and no one muscle should be subjected to the currents for more than three minutes.

The indications for electricity in the treatment of diseases of children are practically the same as in adults. The discussion of the subject by the speaker was therefore limited to diseases in which electricity is of undoubted value.

In chorea a feeble galvanic current should be applied to the head, polarity not stated. In chronic constipation, either galvanic or faradic, one electrode being passed successively over different portions of the abdominal wall. In diphtheritic paralysis faradization of respiratory muscles, particularly the diaphragm, is of some service. In enuresis, broad anode over lumbar spine, small cathode over bladder or perineum, with strong galvanic current for two to four minutes; sometimes faradization for two minutes, wire end of conducting cord made negative and passed one or two centimeters into the urethra, is effective. Facial paralysis, weak stabile galvanic current, anode in auricular fossa, cathode upon muscles of affected side

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four to six times weekly for two to three minutes. Hysteria, static current two or three times weekly, method of administration not stated. Multiple neuritis, faradic current if muscles respond, otherwise voltaic (galvanic) after acute stage has passed for improving muscle nutrition; current should be strong enough to produce visible contraction of muscles and large electrodes are recommended. Poliomyelitis, galvanic current after fourth week strong enough to contract muscles, large electrode over affected spinal region, small electrode labile over muscles. Rheumatism, galvanic, faradic or static, for atrophies following acute stage. Tetany, stabile galvanic current, negative to spine, positive to irritable nerve trunks. Torticollis, weak galvanic current, positive below occiput, negative to contracted muscles, for five to ten minutes.

THE VALUE OF THE ROENTGEN RAYS IN THE DIAGNOSIS OF PULMONARY TUBERCULOSIS.—A. Stanley Green, Archives of the Roentgen Ray, February, 1904.

Dr. Green stated after four years of photographing the lungs, healthy and otherwise, his experience has proven that pulmonary tuberculosis can be diagnosed earlier by the X-ray than by any other means.

In the future if the physicians would have their patients examined by the X-ray the percentage of cures would slowly but surely increase.

The long exposure necessary in the early days of radiography made it impossible to get any fine details of the soft tissues, but now that we have the heavy anode tube an exposure of from 20 to 30 seconds is ample in most cases to produce a reliable radiograph.

By themselves the X-rays are not of such great value as they are when studied in conjunction with the physical signs and examination of the sputum. The doctor stated that he had his patients examined by his partner, Dr. W. H. B. Brock, before making the X-ray examination, and that he had never missed finding the disease when the physical signs pointed to its pr[illegible]

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ence, and in about 50 per cent of the cases he found a more extensive implication of one or both lungs than it had been possible to discover by the usual method of examination. He detected disease by the X-ray prior to its discovery by physical signs, and this was especially shown in those cases where, one apex being the seat of mischief, the other apex becomes involved. In some cases the doctor made a diagnosis with the X-ray six weeks before any physical signs appeared.

The quality of the shadow cast by the different densities varies very much. The author quoted from Dr. Dally's paper, published in the Lancet (1903), a comparison of X-ray and percussion as follows:

Roentgen Rays.	Percussion.
Brightness.	Hyper-resonance.
Trans-radiancy.	Normal resonance.
Faint Shadow.	Impaired resonance.
Dense Shadow.	Dullness.
Opacity.	Absolute dullness.

A fibroid condition of the lungs can be detected in most cases by the X-ray, and this may account for the reason that after all physical signs have cleared up, in many cases the lung as seen by the X-ray appears to be almost exactly as when first examined.

Dr. Green advocates the use of both the screen and the plate in examining pulmonary tuberculosis. When using the screen he recommends the anode of the tube to be placed about 18 inches from the chest, and the patient told to breath quietly; the movement of the diaphragm should then be carefully watched, comparison of both sides, especially for any jerkiness. It is also advisable to examine the patient with the light entering the left axilla and coming out just behind the right scapula, this showing a triangular area of bright light. Each space is increased in healthy subjects by a deep inspiration, but is not affected to so great an extent in tubercular subjects. Other points to notice in the screen examination are the position and shape of the ribs and intercostal spaces on both sides, which must be compared, especially the so-called "roof-tile" condition, which is often present when there is considerable fixation

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of the ribs. The position of the heart is often striking, as it may be pushed over to one side by fluid in the opposite pleural cavity, or dragged down by contraction of the lung. The healthy lung becomes lighter when filled with air, while the diseased lung does not alter.

There has been great difficulty in making a differential diagnosis in stone cutters' and coal miners' disease from early phthisis where the shadows are fine and not very opaque. The doctor draws the following conclusions:

1. Unilateral limitation of diaphragmatic movement is the earliest sign of the onset of pulmonary tuberculosis, and can be often detected by means of the X-ray screen before physical examination reveals its presence.

2. The onset of disease in the second lung is detected earlier by X-ray examinations than by any other method at present at our disposal.

3. The progress of the disease can be watched and registered.

Cavities must be searched for carefully, as their appearances vary according to their size and position, and especially whether empty or full of pus, the cavity may often be emptied by this means, and it then appears as a bright area surrounded by a dark ring.

In regard to radiography the doctor recommends making a separate plate for each lung with the anode placed from 20 to 24 inches from the plate. He also states that he has made all his photographs of lungs for the past two years with the same tube. He strongly advises each operator to stick to the same plate and developer in order that the same results can be obtained.

If chest radiography is successfully carried out all the apparatus must stand in readiness and efficiency and the exposure must be of short duration.

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Current Electrology and Radiology

(Only articles relating to the above-named subjects will be abstracted.)

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE.—Boulogne, France, December, 1903.

1. **Periosteitis Treated be the High Frequency Current.—By Dr. Billinkin.**
2. **Rapid Electrolytic Dilatation of Urethral Strictures.—By Dr. H. Minet.**
3. **Experiments on the Circular Electrolysis of the Urethra.—By Drs. Minet and Aversenq.**
4. **Whooping Cough Treated by Ozone Inhalation.—By Dr. H. Thielle.**
5. **A New Glass Tube for Radiotherapy.—By Dr. Oudin.**
6. **A Case Illustrating the Latency of the Effect of the X-Ray.—Dr. Gurchod.**

1. Eleven cases of periosteitis, eight of them tubercular, were either cured or markedly improved by the application of high-frequency currents, through condensing electrodes. The applications were of five minutes' duration each on every second day. Extensive tubercular periosteitis of the tibia was apparently entirely cured by twenty applications. A tubercular affection of the metacarpo-phalangeal joint of the thumb, with entire loss of motion and atrophy of the thenar eminence, with involvement of the skin and the formation of five sinuses, was likewise treated. Twenty seances resulted in diminution of the size of the swollen osseous extremity and the motion in all directions had begun to be recovered. Dr. Billinkin observes that in cases where the process was advanced to suppuration and sinus formation, response to treatment was quicker than when the skin was intact.

2. The advantages of the method involve two factors—first, the utilization of immediate dilatation of urethral strictures by bougies of proper caliber, through which a galvanic current of negative polarity is passed; second, the addition to the mechanical dilatation of the effect of electrolysis. By this method of rapid electrolytic dilatation it is possible to reduce simple stricture in from two to four treatments.

3. Two kinds of experiments were tried on the healthy urethrae of dogs. In one currents of sufficiently high intensity

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to produce eschars on the wall of the urethra were used so that later the formation of the cicatrix might be observed. In the other currents of low intensity were used in order to ascertain with what current strength per square centimeter of electrode surface undesirable lesions could be avoided. Two applications were made, one just inside the meatus and in contact with it, the other two centimeters deeper. Autopsy was made after seventy-five days. Cicatrix seemed complete, electrolyzed zone was thickened and indurated, yet elastic. This is probably a more desirable condition than stricture itself, yet the procedure is not to be recommended, as it gives only an incomplete result, it is blind in its application, it is impossible to know just how far the caustic effects are carried and it produces a dangerous point of entry for infection. In the second class of experiments a very low current intensity was used. If the current strength was less than one to two milli-amperes applied for five to ten minutes no immediate modification in the appearance of the mucosa was observed. With a current strength of six milli-amperes applied for five minutes ecchymosis was observed after sixteen hours. The same current strength applied for ten minutes produced intense hemorrhagic lesions. A low current strength is then advisable when attempting to produce electrolytic absorption of stricture.

5. This tube is intended to be used in disease of deeply seated organs in natural cavities as the cervix uteri, tongue and rectum, without injury to the walls of the cavity. It is a Crookes tube having two anodes. In front of the anti-cathode is a diverticulum, finger-shaped, which varies in length from five to ten centimeters and which is to be inserted into the cavity. The tube is made of glass, rich in silicate of lead, and thick walled except the tip, which is of ordinary glass and thin. The tube is surrounded by a capsule of celluloid or ebonite, containing a dialectric fluid, such as petroleum and glycerin. The rays pass only through the end of the tube and no sparks will be ejected from the body of the tube.

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BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE, Boulogne, France, January, 1904.

1. Varicose Ulcer Treated by the Static Spray.—By H. Thielle.
2. Contribution to the Study of Defecation by the Aid of the X-Rays.—By J. Delherm and Laquerriere.
3. Icterus Treated by the Sinusoidal Current.—By H. Thielle.
4. Remarks on the Electrical Treatment of Exophthalmic Goitre.—By Dr. S. Dubois (de Saujon).
5. Rapid Infections by Radiotherapy.—By Dr. Oudin.

1. Report on four cases of varicose ulcers treated by Doumer's method of the Franklinic current and the static bath. Two cases were of varicose ulcers on right leg, one accompanied by eczema. Both patients were females. Treatment was very successful, resulting in complete cure.

One case of varicose ulcer and eczema on right leg of a male patient, treated as foregoing ones, had poor result; ulcer reappearing after eighteen months.

One case of ulcer, situated on both malleoli of left leg, treated as above, had poor results; ulcer reappearing after six months.

2. Three or four c. c. of a thick solution of subnitrate of bismuth were introduced, per rectum, into the transverse colon, descending colon and sigmoid flexure of a "Corbaye," leaving a few centimeters above the rectum empty. Observations were made on this empty space, the rectum, and the anus as the bismuth was propelled outward by peristalsis.

The act of defecation was seen to consist of two phases—a preparatory one, which consisted in a transverse constriction breaking off a certain quantity of bismuth, which was propelled toward the anus; and a secondary one; an expelling phase, which was more vigorous than the other, and completely evacuated the rectum.

It took three-quarters of an hour for the "Corbaye" to expel three or four c. c. of the bismuth solution. Galvanic or faradic current passed through the intestines hastened the process.

3. Report on a case of icterus in a woman thirty years of

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age, complaining of pain in the stomach. Stomach disorders had been present during last four years, gradually becoming more severe and frequent. Diagnosed as icterus after thorough examination of urine. Complete cure was obtained after six applications of the alternating sinusoidal current as follows. First application was for twenty minutes, current strength 45 m. a. Result, immediate desire to urinate; urine clear, light green in color. Second application for twenty-five minutes, current strength 55 ma. After treatment urine clear and highly colored, but not as green. Third application, tissue less highly colored, greenish tint lessened. Application for thirty-five minutes; current strength 55 ma. Fourth application, thirty-five minutes, current strength 60 ma. Tissues are much less colored, urine yellow, light and clear. Next day yellowness of tissue had disappeared except in conjunctivae. which were slightly yellow. Urine slightly yellow. Fifth application for thirty-five minutes, current strength 60 ma. Sixth application for forty minutes, current strength 60 ma.

4. Both galvanic and faradic currents were used on same patients alternately in periods of fifteen days each. Faradic current applied according to R. Vigouroux's method. In all cases the results obtained were more favorable under the faradic current treatment than the galvanic, and of the four patients under twenty-five years of age so treated all were cured, while two over that age were greatly relieved, but not cured.

Many cases of Basedow's disease with predominating mental troubles were also treated with the faradic current, and favorable results obtained, but no permanent cures.

5. In treating large tumors by radiotherapy the cancerous tissue is reabsorbed in a more or less virulent condition, which may generate metastatic tumors if the applications are too long or frequent. Two cases of cancer of the breast of long standing in aged women and one in an aged man of recurring sarcoma in the arm were treated by frequent and strong applications. In all three cases, although the general conditions

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of the patients were excellent, they soon developed metastatic growths in the abdominal regions which resulted disastrously in about a month after the beginning of treatment.

JOURNAL DE PHYSIOTHERAPIE.—Paris, France, March, 1904.

1. "Radicular Obstetrical Paralyses of the Brachial Plexus and Their Treatment, by Electricity.—By E. Albert-Weil.
2. Massage in Diseases of the Stomach.—By Dr. Salignat.

1. Causes of obstetrical "Radicular" paralysis of the brachial plexus are generally assigned to compression of the point of Erb by the forceps or the fingers in delivery; the compression of the plexus by the pubis of the mother; the compression above the shoulder in labor; and the rupture of the plexus due to an exaggerated lowering of the shoulder or forced elevation of the arm.

The superior "Radicular" paralysis—type of Duchenne-Erb is the most frequent. Muscles paralyzed are those supplied by the roots of the fifth and sixth cervical nerves.

The inferior paralysis—type of Klumpke—affects regions supplied by the median and cubital nerves. Furthermore, there may be myosis, narrowing of the palpebral opening, lack of lachrymal secretions and narrowing of nostrils.

Total "Radicular" paralysis is the most rare and characterized by total paralysis of the muscles of the upper extremity. All these paralyses may be accompanied by sensory troubles and trauma.

The clinical diagnosis is not sufficient to differentiate between a benign and a severe paralysis as the lesions are the same. To determine a curable from an incurable case it is always advantageous to make an electrical examination.

In benign cases there is galvanic and faradic hyper-excitability. In severe cases certain paralyzed muscles are excitable by the faradic, others by the galvanic current, the shock being always slow. In more severe cases some muscles no longer react to either current except when the galvanic current extends the whole length of the muscle.

Some have diagnosed the benign type as easily cured by light

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massage and saline baths, while others have pronounced severe cases as incurable. Both are wrong. All cases may be cured by the electrical treatment if well applied at an early stage and if kept up for a long time.

The treatment must vary with the severity of the case and the rapidity of the cure. If there is faradic reaction the treatment should be galvano-faradization. A negative electrode, which is always in connection with the positive pole when the interruptor-reverser is in its normal position, is placed at the back. The positive electrode is passed successively over the motor points of all the muscles affected. A longer pause is made at the Erb point than elsewhere. Current strength should be from 8 to 10 ma. Induction is controlled by relative position of primary and secondary coils. Each treatment should be of 10 minutes' duration and repeated three times a week.

If some muscles show degeneration galvanic current should be used, without interruptor or reverser, and applied for about 3 or 4 minutes at each treatment. The interruptor may be used when the muscle is strengthening. Benign cases may be cured in a month, while severe cases take a long time, four or five months or more.

Society Meetings

At the annual meeting of the New Haven Dental Association, held March 14 and 15, 1904, a paper on "The X-Ray" was read by Dr. Ralph A. McDonnell, professor of dermatology at the Yale Medical School. A comprehensive, general survey of the uses of the X-ray was given, its use in general diagnosis being particularly dwelt upon. Unerupted teeth and the other pathological conditions of the jaw bones in the finding of which it is useful were mentioned and Dr. McDonnell stated his belief that as a diagnostic agent the X-ray is invaluable. Its therapeutic uses, more particularly as concerning

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dermatology, were dwelt upon at some length, the author believing that a "New era, the era of radiotherapy," is dawning in this field of medicine. He spoke disparagingly of its curative capacity as regards deeply located, malignant growths and stated that growths under the skin that were removed by the X-ray usually disappeared by a process of suppuration.

During the discussion Dr. H. E. Hosley of Springfield reported a case, a young woman of twenty-five, which showed a temporary lateral tooth in place and the teeth on both sides loose. There was no sign of the permanent tooth until the X-ray was used, when they were able to locate the unerupted lateral, which is now coming down.

Dr. G. Lenox Curtis of New York thought that the only use to which the X-ray could be put in dental work was for diagnosis, but considered it especially valuable in this connection. A skiagraph was likely to be misleading unless correctly interpreted, and he quoted as illustrating this fact the case of a patient who came to him for the treatment of a discharge from the neck which seemed to come from the lower jaw. On this side of the jaw all the teeth were gone from the first bicuspid to the wisdom. Skiagraphs were taken by a good radiographer, who stated that it showed an impacted molar on the affected side. After investigation Dr. Curtis decided that the shadow was that of a molar on the other side of the jaw and was able to prove his case by exploratory examination.

Dr. H. C. Boenning of Philadelphia stated that some years of careful work had convinced him that the X-ray was invaluable for purposes of diagnosis, but that he had lost all confidence in the X-ray as a curative agent in the treatment of deeply-seated growths. The local effect was to produce a marasmus of the part exposed. He did not know of a single case where deeply-seated tumor had been benefited by the action of X-rays and observation of a large number of cases had convinced him that it was not of the slightest benefit. Whether or not this method of treatment can be developed to the point of

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efficiency is a matter for the future to decide. The best method of skiagraphing the jaw is to place a photographic film, protected by waterproof paper, on the inside of the alveolar process and the Crook's tube outside, and even then it is sometimes difficult for the most experienced operators to get good radiographs.

Dr. C. E. Skinner of New Haven, Conn., took exception to the pessimistic statements relative to the use of the X-ray upon deeply-located growths and referred to several cases of deeply-located cancer that had been cured or benefited by X-ray treatment. One was a recurrent fibro-sarcoma as large as a man's head, which after 18 months' treatment had disappeared to such an extent that only a small area of slight induration was discoverable upon deep palpation. He recommended initial extirpation of deeply-seated growths to be followed by X-ray treatments to prevent recurrence. It had been his experience that growths located under the skin did not disappear by suppuration, but simply faded away by a process of absorption. His only experience with the X-ray in connection with dental work had been in the treatment of several cases of osteo-sarcoma of the upper jaw, but he had never observed any curative effects. Dr. Weston A. Price of Cleveland, Ohio, had done a great deal of work with the X-ray and two cases of pyorrhea alveolaris were quoted in which Dr. Price had secured very striking results by the use of this agent.

Dr. H. L. Wheeler of New York said that at the St. Bartholomew clinic, with which he is connected, some experimenting along the line of X-ray therapy in dental diseases had been done. One case of pyorrhea alveolaris which had resisted absolutely all ordinary methods of treatment was very greatly benefited by X-ray treatment and the pyorrhea had entirely disappeared. They had had very satisfactory results in getting good radiographs by putting the plate in a rubber envelope and putting this in the mouth against the alveolar process with the Crook's tube outside.

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New Apparatus

RADIUM RECEPTACLES FOR THE STOMACH, OESOPHAGUS AND RECTUM—By Max Einhorn, M. D. —Medical Record, March 5, 1904.—These were invented by Dr. Einhorn for the purpose of applying radium rays directly to malignant disease of the digestive tract, and are manufactured by Stohlmann, Pfarre & Co. of New York.

The receptacle for use in the stomach consists of a glass capsule that can be screwed apart, the upper portion of which is provided with an opening for the attachment of a silk thread. The radium flask is inserted into this capsule, the latter is screwed together, the silk thread attached and knotted. The silk thread must be about 75 cm. long. There should be knots at 40, 50 and 63 cm. The first knot (at 40 cm.) indicates the distance of the cardia from the lips, the second (at 50 cm.) how far the capsule should be distant from the cardia, and the third (at 63cm.) the distance from the mouth to the lobe of the ear.

The patient swallows the capsule with the contained radium and then drinks a glass of water, the capsule is allowed to descend toward the intestine until the 50 cm. knot is at the lips and the rest of the thread is then tied to the ear.

The radium is left in the stomach for about an hour and is removed by detaching the thread from the ear and making traction thereon. Resistance will be encountered when the capsule passes the cardia and in the region where the oesophagus is pressed upon by the larynx, and must be overcome by gentle traction. In the latter situation the patient may be told to swallow and the instrument removed during this act.

The receptacles for use in the oesophagus and rectum are constructed of glass or aluminum on the same principle as the stomach instrument, but a socket with a screw thread for attaching a bougie is provided instead of the hole for the silk thread. After the radium is inserted the bougie is attached and the glass capsule can be located wherever the disease focus is.

Dr. Einhorn has only been using the instrument a short time and is not prepared to say anything about the practical usefulness of it as yet.

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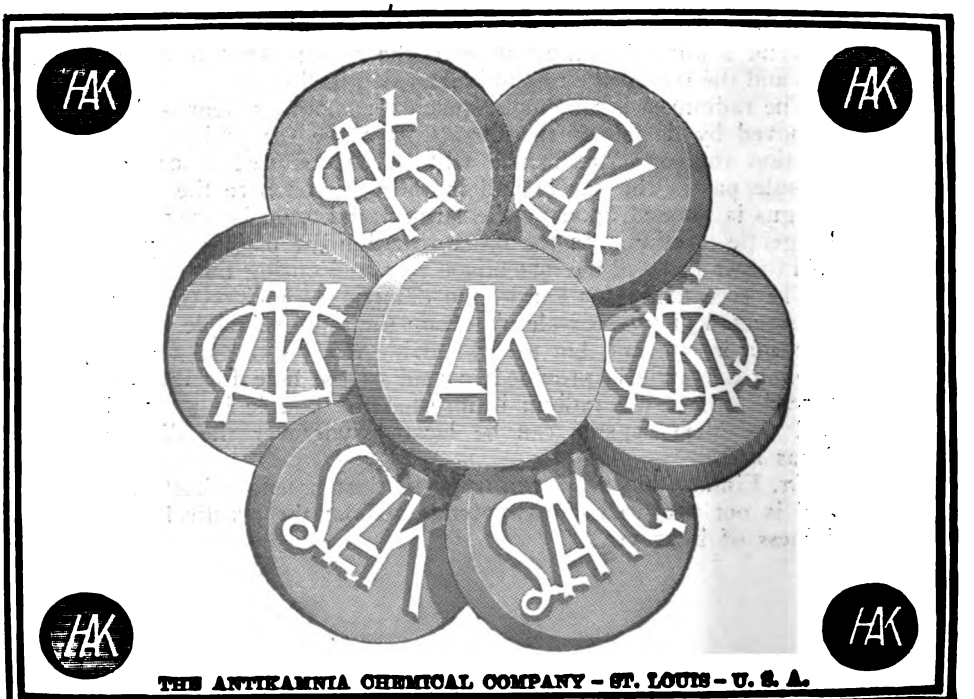
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Archives of Electrology and Radiology

Vol. IV May, 1904 No. 5

Original Contributions.

DEVELOPERS.*

By Gordon G. Burdick, M. D.,
of Chicago, Ill.
Chief Surgeon People's Hospital, Professor Radio-Therapy and Photo-Chemistry, Illinois School Electro-Therapeutics; Associate Professor Surgery, Post-Graduate Medical School; President Chicago Electro-Medical Society.

A study of these important agents with reference to their value in skiagraphy is appropriate at this time. The diagnostic value of the X-ray is only feebly appreciated by surgeons. The result is that this branch of art is still in a crude and expensive stage. Few operators have had opportunities to develop skiagraphy down to a fine art. By mutual consent the different parts of this work have been left in charge of certain individuals, other operators having their hands full attending to the medical end of the business, and it seems impractical to combine both branches of this work under one head, as one or the other is bound to suffer if neglected.

Developers have certain characteristics that render each one peculiarly suitable for given conditions, so probably the best way to consider them would be in the order of their chromagenetic properties. We find that each developer imparts to the polarized silver molecule a characteristic stain, while reducing the complex molecule of silver bromide to the simpler form of metallic silver; and they might be considered first from the non-actinic end of the spectrum, and, curiously enough, their value in skiagraphy decreases as the color moves upward toward the chemical end of the spectrum.

*Read at the fourth annual meeting of the American Roentgen Ray Society, at Philadelphia, Pa., December 9, 1903.

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Ortal stands at the head of the list, giving a brown stain, a mixture of red and yellow, the only known member of this group.

Acid Pyrogallic—A brilliant yellow. This is the oldest known developer, and by old-time photographers considered the best for all purposes, which is probably true outside of large towns, where we have to contend with so large a proportion of organic matter and gases in the atmosphere that a solution of this wonderful reagent is oxidized in five minutes when exposed to these influences and requires several additions of fresh developer before a skiagraph has been developed far enough to give us contrast enough to make a good proof. This agent has the serious drawback of causing a severe eruption to appear upon the hands of many people, which is very objectionable to X-ray operators.

Eikonogen gives an orange color and is free from the objections of pyrogallic acid, as it causes no irritation, works clearly and may be used repeatedly. However, it has two serious drawbacks from a skiagraphic standpoint. It is very slow in its action when not concentrated, requiring a full hour in order to give enough printing contrast; and if used stronger will reduce the bromide of silver not polarized by light, covering the negative with mirror-like spots in the shadows that have been mistaken for disease in many cases upon the positive proof.

Hydrochinon imparts a dark green stain to the silver molecule and enjoys the distinction of being the most contrasty developer known. This oxidizing agent has more curious properties than all the rest of the reducing agents combined. But time is too short to consider more than a few of them. This developer is interminably slow in its action, but acts as a clearing agent, building up the high lights at the expense of the shadows. It does not show the slightest disposition to veil or fog a plate, even if left in it for twenty-four hours. A negative developed by this agent has only two tones—high lights and shadows. The medium tones disappearing completely, being intensified at the expense of the shadows. So by using this

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agent we get the outline shadows of bones, which are wonderfully clear and full of detail. But the disease of the soft tissue will not show up, being lost in the medium tones that merge into the high lights. This developer requires at least three hours to completely reduce the polarized silver to a simpler form and develop the plate as far as may be possible by this agent and of the bony structure gives the most delightful negative.

Metol gives us gray deposits, is not very actinic, but has the peculiar property of working very quickly and giving a wealth of detail. Negatives made by this developer are remarkably soft, but all the finer tones show beautifully by transmitted light and it is probably the best developer for stereoscopic skiagraphy.

Amidol, giving a blue black, is the last agent we will consider. This agent has the peculiar property of requiring less than one-tenth the exposure of any other agent and is the developer par excellence for instantaneous skiagraphy. If properly used it will give a very fine negative from very quick exposure. The negative is fine by transmitted light, but is so transparent to the actinic rays that good positives can rarely be obtained.

We usually require in a good skiagraph as much contrast as it is possible to get without spending too much time to get it, so that we usually select some developing agent that gives a good non-actinic color to the negative, and each one of our contrast developers has idiosyncrasies that makes it more or less desirable for different purposes.

In hydrochinon we have the agent that will actually strip the bones of flesh, killing all the half tones and building them up at the expense of the shadows. A negative developed with this agent is usually so harsh and requires so long a time to make a positive print that it is rarely used alone. Combination developers give better satisfaction, taking the good qualities of each, submerging the less desirable.

After trying nearly everything in this line of reagents, I have decided that a mixture of ortol and metol gives the best

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all-around negative for skiagraphy. I use it in the following combination:

(A)

Ortol	15.
Metol	15.
Meta bi-sulphite of potassium	.75
Bromide of potassium	1.
Aquae dist.	1000.

(B)

Aquae dist.	1,000
Sodii sulphite C. P. dry	40
Sodium carbonate, dry C. P	60

Use 30 c.c. of each and dilute with from 30 to 120 c. c. of water, according to effects desired. The less water the more contrast, while by diluting the reagent more the softer the negative will be and the more detail will be seen.

The ortol is used because it imparts a brown color, which gives the greatest possible contrast and shows no disposition to fog or veil, no matter how long a plate is left in the solution.

Metol is used because it brings into the negative a wealth of detail and in the strength here recommended shows no disposition to fog a plate.

Sodium sulphite C. P. dry is used in the solution simply to impart a black stain to the silver molecule; as negatives developed without this reagent show the characteristic aniline stain from each agent used, but by using sodium sulphite we obtain a brown black deposit of very fine grain, giving good printing density.

Sodium sulphite is one of the most delicate salts used in photographic chemistry; if exposed to the air for a few minutes it is oxidized to sodium sulphate, and a few grains of sodium sulphate will reduce bromide of silver not polarized by light to metallic silver, causing a veil or fog to cover the plate. This salt should always be purchased from a reliable maker in original bottles and if possible the entire contents used when it is opened.

Meta bi-sulphite of potassium is used only to preserve the developer and prevent the action of the oxygen of the air upon the solution.

Sodium carbonate is not required in a developing solution and is usually harmful, as its function is to save time only, by rendering the gelatine soft or soluble, according to the amount used. If the carbonate is used in too great a strength we will note a loss of sharpness to our lines; they are no longer clear and distinct. The gelatine having become so soft has changed its position upon the plate and relation is lost.

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Let us consider the factor of the temperature for a few minutes before closing this paper, as it is probably the reason why more failures are recorded than successes by amateurs in this line.

We find photographic chemistry depends upon sharply defined limits in order to produce perfect results. And these limits are from 60° to 75° F. At a lower temperature we will get a coarser and more contrasty deposit, with less development of tones, requiring more time to complete the development, and as we approach the maximum limit we gradually pass through a shifting phenomena of tones, until we get a soft negative with a wealth of detail, making negatives suitable for skiagraphic stereography. If we increase the temperature higher we find that considerable silver bromide is reduced, not polarized by light; and at about 80° F. we begin to lose sharpness by the shifting of the soft gelatine, and by increasing the temperature to 90° F. we have a negative so flat and thin, but full of wealth of detail that it is impossible to use it for any practical purpose. This is due to the solution of the gelatine, from the increased temperature and the alkali in the developer.

Analine derivative developers are capable of being mixed in various proportions as desired and may be used repeatedly if they are carefully saved in a close-stoppered bottle, and while they work slower each time, the resulting deposit is more beautiful.

It should not be necessary to impress upon all amateurs that all solutions used for developers should be filtered before using, as a crystal free in the solution will intensify its action locally, making streaks or spots as it is moved back and forth or by coming to rest for a minute.

Developers should not be exposed to the air while not in use, or a slow and gradual decomposition will take place which is told by the brownish color of the solution.

Amateurs will get better results by developing the plate in the dark and not looking at it every few minutes to see if it is carried far enough, as with this solution I have given the time element alone is important when sufficient exposure has been given.

A hand will develop in fifteen minutes, while a hip joint may require one hour. With the exception of skiagraphs of the hand and chest it is rare to get one with too much contrast, so that the fear of overdevelopment may be neglected.

Success in photography means absolute cleanliness of hands, trays and solution. It means the absolute precision in weights as well as pure chemicals.

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THE THERAPEUTIC EFFECTS OF THE X-RAYS AS SHOWN FROM THE RESULTS OF TREATMENT OF NEARLY ONE HUNDRED CASES.*

By Henry K. Pancoast, M. D.
of Philadelphia, Pa.

(*Concluded from last issue.*)

The question has frequently arisen as to recurrence following an apparent cure by X-ray treatment. There is no longer any doubt as to the possibility of recurrence and the X-ray has the advantage over the knife only in being able to penetrate deeper and with less disfigurement and in prolonging the treatment in its ability to prevent recurrence. Having obtained a cure according to subjective and objective signs, there are certain cases in which we can practically say that there really is never an absolute removal of the growth or its source. Carcinoma of the cervix uteri is one of the most decided examples of this class of cases. The next three reports are of patients in whom recurrence has followed cure by Roentgen ray applications.

Case IX. Carcinoma of the cervix uteri. Thirty X-ray applications followed a curettement and the patient was declared cured, but was advised to return for treatment once a week for a while in order to prevent recurrence. The word "cure" seems to satisfy some minds that give no thought to the future, and this case comes within such a class of individuals. She failed to carry out our advice and in six months returned with a recurrence that was just making itself manifest.

Case X. Epithelioma of the right temporal region that began about two years previous to the time the patient was sent to us. The growth had been treated by "plasters" and healed, but had afterwards made its appearance in a contiguous area and was commencing to break down the area already healed, and was invading both eyelids, causing almost a complete closure of the palpebral fissure. Treatment was begun October 27, 1902, and up to December 17th, twenty-two applications of ten to fifteen minutes each were made. The eyelids had healed

*Read at the Fourth Annual Meeting of the American Roentgen Ray Society, at Philadelphia, Pa., December 10th, 1903.

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but a troublesome edema of the conjunctiva developed, necessitating the shielding of the orbital region in the future, except for an occasional treatment. In this case as in others treated for growths involving the eyelids, it was found that when an edema of either the conjunctiva or lids had once developed, it was a most difficult condition with which to deal and even one additional application now and then would serve to make it worse. From December 17th to February 3d, 1903, only eleven treatments were given and the edema was no better and the skin was slightly burned around the margins of the diseased area. The ulcer was lightly curetted under cocain anaesthesia. The area was thoroughly curetted February 26th under ether, no treatments having been given in the interval. A thick slough was removed and the bone exposed. It may be well to mention here that in several cases in which epitheliomata have been treated in which the growth extended down to bone, great difficulty was experienced, not only in being able to tell when to let up in the applications in order to allow the healing process to begin, but also in promoting the process of granulation and obtaining a new growth of healthy connective tissue and skin. The ulcerated area was healing nicely, when on March 19th he had to be admitted to the eye service of the hospital on account of beginning ophthalmitis. It was decided best not to perform an enucliation as the patient was found to have a chronic fibroid phthisis, involving both lungs. The eye got well except for the corneal opacities and xerotic keratitis still remaining, and he was soon discharged and never reappeared until May 29th when he presented a large fungating recurrent growth of the right temple behind the old ulcer, which was not yet quite healed but not much involved in the new growth. The recurrent area was the one that had been once before healed by plasters previous to his appearance before us, and which was then beginning to show some few spots of degeneration, but these were quickly cured. The patient was admitted and the new growth was curetted. A poor photograph (Fig. 11)* is shown, which indicates his appearance then.

*See cut, page 127, April issue.

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He was treated 34 times, five minutes each time, from June 4th until August 30th, when he was discharged to become an out-patient, as a hospital was thought to be a poor place for such a patient through the summer. The ulcer remaining about the size of a half dollar showed no microscopic evidences of malignancy, though the surrounding new skin was thin and of poor vitality, as there was very little tissue covering the underlying bone and a poor blood supply. A photograph taken July 16th (Fig. 12) shows the improvement at that time. Xerotic keratitis and conjunctivitis were still present. X-ray treatment was to be continued as a preventive of recurrence, and from October 9th until December 3rd, twenty applications were made, the patient having been admitted for an interval during this time.*

Case XI. Large epithelioma on the right side of the thoracic wall, 6½ inches wide laterally and 4½ inches wide from the lower border of the great pectoral muscle to about the costal margin below, and extending slightly to the left of the sternum. This growth was of about eight years' duration. X-ray treatment was begun April 26, 1902, and during that year until November 21st, 77 applications were made, varying from 5 to 10 minutes each. At that time the patient was unable to continue his visits on account of general weakness, and a very marked contraction of the thorax and abdomen in front, causing a very prominent dorsal kyphosis and greatly deforming him. The ulcer had diminished to almost half the original size, but continually discharged portions of costal cartilage uncovered by the disappearing malignant base and a greater part of the edge remained undermined and ragged, except at the lower and inner area. Exercise seemed to have no effect in relieving the contraction of the body.

The patient returned May 20th, 1903, feeling and looking much better than when last seen six months previously. The contraction had improved to a considerable extent and the

*Since this paper was prepared, and a few weeks later than the convention, this patient developed an abcess of the orbit and on operation a considerable area of epitheliomatous metastasis was discovered in the orbital cavity, it having been entirely hidden from view hitherto.

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ulcer was about 3½ inches in diameter, and had a smooth and healthy, though rather indolent, base, and the edges, except for a small area below and to the left and above, under the great pectoral muscle's edge, were likewise healthy and not undermined. Here we see marked improvement by the patient keeping away from the X-rays and dressing the area himself. But, just below the ulcer in the abdominal wall, there was seen a large mass, the size of an adult fist, and to be recognized as a recurrence or extension. From May 20th to December 3rd, 52 applications were made, and this new growth has practically disappeared, but the ulcer, though smaller, shows but little improvement compared to what was expected.

But this is enough of unpleasant things, and now looking upon the brighter side of life, something will be said about cases that have been improved or cured.

Case XII. Recurrent epithelioma of the dorsum of the right hand. The growth has twice recurred after operation, and was curetted in August, 1903, at the University Hospital, as a preliminary to the X-ray treatment. He was referred to the department August 22nd, and up to December 4th received 31 applications averaging about 5 minutes each. The photograph (Fig. 13)*was taken September 5th after 7 treatments. At the present time (December 10) there remains a healthy ulcer about the size of a five-cent piece. The whole hand is receiving the rays frequently as a preventive measure.

Case XIII. Multiple epitheliomatous ulcers of the frontal and temporal regions. The first photograph (Fig. 14)†shows the condition when treatment was begun July 21, 1903. The second picture (Fig. 15)*taken September 5th, indicates perhaps some improvement, but the area posterior to the external canthus has broken down more. The third plate (Fig. 16)* gives proof of considerable improvement. Up to October 24th, thirty-four treatments were given, each averaging 5 to 8 minutes, and then the patient ceased to make his appearance any longer.

Case XIV. Epithelioma of the tip of the nose, which made its appearance about three years before treatment was begun by the X-ray. The skin dispensaries of two hospitals failed to bring about a cure, but this was very likely due to the irregu-

*See cut, page 127, April issue. †Negatives damaged and therefore not shown.

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larity of her visits. X-ray treatment was started February 20th, 1903, and exposures of 5 to 8 minutes were made two to three times a week until May 24th. The photograph (Fig. 17)‡ shows the condition at that time. Future records were lost, but the last visit was made June 29th, at which time the growth had entirely disappeared. The patient was advised to return once a week thereafter as a preventive of recurrence, but she has never been seen since. No doubt we will see her again, or some other hospital will have her on its records, as there will no doubt be a recurrence through failure to carry out the after-treatment.

Case XV. Rodent ulcer of the nose. The area was first curetted and X-ray treatment was started July 28, 1903. The picture (Fig. 18)† shows the appearance September 10th after 18 applications. In all, 32 treatments, averaging 6 minutes each, were given, and the patient was discharged September 17th with the area entirely healed. The patient returned to his home and has been having occasional applications to prevent recurrence, and expects to return later to undergo a plastic operation for restoration of the appearance of the nose.

Case XVI. Epithelioma of the left cheek and temple (Fig. 21). Came for treatment November 24, 1903. After three applications of 10 minutes, the fungating area on the cheek was curetted last week and X-ray treatment has been resumed. It is too early to expect improvement as yet, though it is to be looked for.*

The foregoing cases serve as examples of the results to be obtained in the treatment of superficial cancers by means of the Roentgen rays. The next superficial growth to be mentioned is lupus. There may be some doubt as to whether these rays or those of the violet end of the spectrum are the more effective in dealing with this lesion. Finsen himself has given out the decisive statement that a powerful arc light (with rock crystal lenses) is the only source of ultra violet rays to yield good results, and it is very doubtful whether or not there are more than a very few devices, if any at all, in this country capable of doing the work Finsen directed as it should be done. There are hundreds, however, who are able to generate X-rays as powerful and efficient as can be done anywhere in the world, and should they prove as effective as the ultra violet rays, they have many advantages over the latter. But there is much doubt as to whether they are as destructive to the lesions of lupus as the Finsen light properly used, and there are to be

*Since cured after about 20 applications.
‡See cut, p. 127, April issue.
†Negative damaged and therefore not shown.

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considered such dangers as burns, risks to the eyes, destroying the pigment of the skin and many others.

Case XVII. Male, colored, 19 years. Lupus of three years' standing, involving each side of the face, each upper and lower eyelid and the nose. His first appearance at the hospital was made at the eye dispensary on account of a double ectropion. The nose was about twice the natural size and covered by a papillary growth. The eyelids were very much swollen. X-ray treatment was begun February 15, 1903, and directed to all parts affected, but great care was taken to protect the eyes as much as possible. Up to December 1st, 151 applications were made of 3 to 10 minutes duration each. The photograph (Fig. 22), taken July 16, shows the patient's appearance when about 50 per cent improvement had taken place. It will be noted that the black pigment of the skin has in many places been destroyed, but this has occurred only in areas where new skin has formed. At the present time the nose is almost entirely healed, though white, the ectropion is much less marked and the whole appearance of the face is much better. Instead of being an outcast, the man can now mingle with humanity, and we have the greatest hopes of curing him. We look upon him as our prize patient. There is grave doubt as to whether there will be a deposition of pigment in the new skin, but it is to be expected that there will be some effort at least to restore this loss, and there really does seem to be some slight change to a darker hue already.

Case XVIII. Female, white, 42 years of age. Lupus of the nose of about three years' duration. The first picture (Fig. 19)‡ shows the condition when treatment was started November 11, 1903, and the next one (Fig. 20)† represents her appearance at present after 12 applications of about 10 minutes each.*

In dealing with keloids, and hypertrophied scars, we have to consider growths made up for the most part of fully organized tissue, and not of cells of less vitality than normal ones. Therefore the process of removal must be largely one of destruction. The treatment is of necessity a very long one. In all of our cases the treatment has been pushed to the point of a slight burn, and in all of them, being negroes, the pigment has been more or less destroyed in the skin.

Case XIX. Female, colored, age about 21. Keloid of the left auricle following piercing of the ear. Treatment was be-

*This patient has been discharged cured, after receiving about 25 treatments.
†Negative damaged and therefore not shown.
*From page 158.
‡See cut, p. 127, April issue.

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gun November 3rd, 1902, and by May 11, 1903, after about 65 exposures of 10 to 15 minutes each, the patient was declared cured, though one application was made every week for a time, as a preventive measure. Thiosinamin was given throughout the course of treatment.

Case XX. Female, colored, age 39 years. Keloid of the right auricle and side of the neck and face and back of the ear following an operation for suppurative cervical adenitis (post-typhoidal) at the age of 16 years. The growth was removed 12 years ago, but recurred in two months. The first exposure was made August 21, 1902, at which time the first picture was taken (Fig. 23). Thiosinamin was given for a while, but could not be borne by the stomach. The growth was extremely painful and tender, but these symptoms have disappeared except to be present during some peculiar phenomena that will be mentioned later. For a long time, also, we were unable to account for the pain in the neck below the growth and radiating down the arm, but examination showed this to be due to double cervical ribs, the one on this side being more prominent. Nineteen exposures of 10 to 15 minutes each were made up to October 13th, when the first of a series of peculiar attacks made its appearance. The growth became very painful and exquisitely tender, and then gave all the other local signs of inflammation followed by suppuration, and also the usual constitutional symptoms of a mild suppurative process with absorption of products were present. A week following the last exposure a large abscess was opened, the cavity seeming to extend beneath the whole of that part of the growth on the side of the face and neck. Thick greenish and foul pus was discharged. The abscess healed in a few days, almost without drainage, the infection not appearing to be virulent. The destruction of tissue appeared to have been in the healthy normal structures under the tumor or in the adjacent portion of the growth itself. After healing, there was a noticeable subsidance in the size of the neoplasm. Treatment was continued from November 2nd until November 23rd, 12 exposures of 10 to 15 minutes each being given, and then there was an interval on account of burning of the skin. After 9 more exposures during the remainder of the year, the patient was admitted to the hospital January 4, 1903, on account of edema of the arm resulting from pressure of the cervical ribs on the subclavian vessels. After 7 more exposures of 15 minutes, treatment was again stopped January 20th on account of X-ray dermatitis, and February 11th another abscess under the growth was open-

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ed and the same character of pus evacuated. There were present the same constitutional symptoms as previously noted. Healing was complete in a short time with again a subsidance in the size of the mass, and application started February 25th. From then until September 4th, 50 exposures were made varying from 8 to 20 minutes each. The second photograph (Fig. 24) was taken July 16th. September 7th the growth behind the ear was removed. This was thought to be a fibro-lipoma, but microscopic examination shows it to be a keloidal tumor, and we have learned that it is common in the southern states to find this shaped growths behind the ears of negroes with keloids in this region. From September 13th to October 31st, 19 exposures were made, and then once more there were local and constitutional symptoms of suppuration under the tumor. We stopped just in time, and even though there was softening and suppuration, the area did not have to be opened. Again there was a decrease in size. Five additional treatments have been given, and now the growth is almost reduced to the level of the surrounding normal parts. For a while, the scar of the operation was not exposed, but it showed very early signs of hypertrophy, and treatment was directed to it, but as yet without stopping the increase in size. This is an important point as it has been thought possible to remove a keloid by the knife and use the X-ray in preventing a recurrence. The photograph shows the destruction in certain areas of the skin pigment.

Case XXI. Female, mulatto, age 27 years. Keloid of the helia and lobule of each ear following "piercing." From February 14, 1903, to the present time, 80 applications have been given to each side, varying from 6 to 10 minutes at each exposure. There has been some improvement, but it is not so marked, as we have not pushed the treatment and the patient has been irregular in attendance. The photographs, one of each side (Figs. 25-26) were taken May 24th, and show mainly the destruction of pigment even in this mulatto.

Case XXII. Male, colored, age unknown. Multiple keloids, backs of both hands and wrists, both sides of necks, etc. But a few exposures were made and the case is mentioned and the photograph of each side (Figs. 27-28) shown simply to show that there has been a destruction of black skin pigment on account of another variety of burn than X-ray burn. This patient was injured in a gunpowder explosion and the growths followed.

As to sarcoma, we have had but little experience in the treat-

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ment of this form of malignant growths, and although in some ways the results have been satisfactory, we are pretty well convinced that it does not respond well to the X-rays.

Case XXIII. Male, white, 19 years of age. Large recurrent sarcoma of the anterior abdominal wall, as shown in the photograph (Fig. 29)*. There was a large nodular mass about the size of an adult fist, ulcerated and fungated on top and bleeding profusely and readily. X-ray treatment was started January 14, 1903, four months after this recurrent growth was first noticed. Thirty-eight exposures of 30 minutes each were made daily except Sunday, with the tube but 2 or 3 inches from the skin. There was really no severe burn until the end of these six weeks, and at that time, March 9th, the growth had decreased to at least half its original size. The patient was then obliged to suffer quarantine in the hospital ward on account of smallpox breaking out there, and when his isolation was over in two weeks, he preferred to return home, as the sarcoma had begun to grow rapidly again. This case is of interest on account of the very severe and prolonged treatment given before the appearance of any very bad X-ray dermatitis. The most rapidly appearing burn we have ever noticed was one that made its appearance in less than 24 hours after a single 20-minute exposure.

Case XXIV. Female, white, about 55 years of age. Sarcoma of the anterior surface of sacrum. It was inoperable, and X-ray treatment was given through the vagina by means of a German silver Ferguson speculum. The rays were also directed through the body both from the back and front. From January 4th, 1903, to April 5th, 30 vaginal applications of 15 minutes each were made and 21 exposures through the body. There was very great improvement, but the patient ceased coming.

This covers all the ground intended for this report with the exception of carcinoma of the uterus, but some mention has already been made of that subject. Leg ulcers, Hodgkin's disease and Paget's disease and several other conditions are also included in our list of cases, but time will not allow our taking up these subjects. We have tried to give you a few general ideas about the cases as we have found them at the University of Pennsylvania Hospital, and we hope that we shall be able to hear of the experiences of some of our members from different sections of the country, as we are all here to learn something.

*Negative damaged and therefore not shown.

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Editorial.

For the benefit of those not fortunate enough to possess a specimen of radium of high activity, e. g. of 7,000 or more, an experiment described by Prof. Wood of Johns Hopkins University in a recent number of "Science" may be of interest.

Prof. Wood found that by mixing a very small quantity of radium of very low activity, say of only 200 or 300 with a comparatively large amount of some inexpensive fluorescent substance the whole mass when viewed in the dark would become self-luminous and that it would present a very striking appearance if looked at through a magnifying lens of low power.

It is to be noted that such a mixture is even more luminous than the same mass of radium bromide of an activity of 10,000 or more and it is unfortunate that this fact has been made use of to quite an extent by a number of unprincipled people to practice deception upon those who have an idea that the value of a sample of so-called radium is determined by its luminosity. Powdered willemite when mixed with a minute quantity of even weak radium closely resembles the real article as a whole, and is quite as luminious and so one unskilled in the various tests may easily be deceived into buying it for a high price. Such a mixture is, of course, absolutely worthless for any therapeutic uses.

The electrical test is probably the quickest and most reliable. though the photographic method is good if employed with care.



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Miscellaneous Abstracts.

RADIOSCOPIC AND RADIOGRAPHIC APPEARANCES IN PLEURISY.

J. F. Halls Dally, London Lancet, February 27, 1904.

A radioscopic examination of every case of pleurisy met with in three months at the Royal National Hospital for Consumption, Ventnor, England, showed that in only two was there a loss of clearness in that part of the field corresponding to the affected area. In one case excursion of the diaphragm during forced inspiration was less than half on the affected side what it was on the unaffected side.

For examination of pleurisy with effusion, the patient should first be placed in a sitting posture with the tube posteriorly and the screen in front of the chest; then with tube anteriorly and screen at the back of chest; next lying quite flat on the back on a canvas stretcher with tube underneath and screen upon chest; and finally, lying upon the abdomen, tube underneath, screen upon back. For the last two positions may be substituted lying upon either side successively with the positions of the tube and screen relative to the body successively reversed. The chief points to note during examination are: (1) The height of fluid on affected side; (2) contour of upper margin of fluid; (3) if the rib outlines are distinguishable; (4) position of heart; (5) movement of diaphragm if visible. The fluoroscopic screen is preferred to the radiograph for examination purposes because of the greater facility with which alterations in the position of the effusion can be recognized.

Dally finds that in the vast majority of cases radioscopic findings correspond with those of percussion and that pleuritic adhesions are responsible for the bulk of the discrepancies. Sero-fibrinous effusion and empyema can usually be distinguished, as the shadow in the case of the latter is much denser. The former throws a light shadow with a well-defined curved upper margin and the rib outlines are not obliterated; the lat-

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ter throws a very dense, even opaque shadow, and rib outlines usually are obliterated. Pleural effusion can usually be distinguished from thickened pleura by the change in the upper margin, which takes place upon movement.

The conclusions dictated by his experiences are: (1) That the level of the fluid changes with the position of the patient unless (a) the quantity be great or (b) it is encysted by adhesions; (2) that a purulent effusion yields a denser shadow than a sero-fibrinous one; (3) the shadow is homogeneous and in serious effusions increases in density from above downward; (4) that however far the heart is displaced to the right little alteration takes place usually in the position of the apex relatively to the base; (5) other conditions being equal the heart is displaced more with left-sided effusion; (6) an abnormal triangular shadow above and continuous with that of the heart and pericardium is cast by the mediastinum which is displaced by the lateral pressure towards the healthy side of the thorax.

AN INQUIRY INTO THE VALUE OF THE X-RAYS IN BRONCHIECTASIS.

D. B. King, London Practitioner, February, 1904.

Twenty cases were repeatedly skiagraphed and the findings studied in connection with the physical signs, in the hope that contributions to diagnostic accuracy would result whereby there might be opened up "A new era in the surgical treatment of the condition—hitherto almost a closed chapter in the history of medicine."

It was endeavored in each case to ascertain the presence or absence of (1) dilated bronchial tubes, (2) saccular cavities, (3) foreign bodies, (4) impaired action of diaphragm, (5) morbid condition of lung tissue, with the following results:

1. In discovering dilation of the bronchial tubes the X-rays gave no information that was not obtainable by ordinary physical methods.

2. The X-ray failed to reveal saccular or gangrenous cavities which had been demonstrated to be present by physical

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diagnosis, probably because of the extremely fibrotic condition of the lung-tissue by which the cavities are surrounded in these cases.

3. The density of the shadows was found to vary with the degree of pulmonary fibrosis present, and in some cases was so great as almost to obscure the rib outlines.

4. For the detection of foreign bodies the X-rays are of great use, especially in early cases before dense fibrotic tissue has had time to form. Care should be exercised in interpretation, however, as the X-ray indicated a foreign body in one case where post-mortem demonstrated there was none.

5. In most of the early cases the action of the diaphragm was impaired and in some of the advanced cases it was almost *nil*

King concludes that early cases should always be skiagraphed, as a foreign body may be the cause of the trouble and will usually be revealed by the X-rays when other methods of diagnosis will fail.

In most cases the rays give less information than the stethoscope and are of no use in facilitating the surgical treatment of the disease.

A COMPARISON BETWEEN THE MEDICAL USES OF THE X-RAYS AND THE RAYS FROM THE SALTS OF RADIUM.

F. H. Williams, Boston Med. and Surg. Journal, February 25, 1904.

The diagnostic and therapeutic uses of the X-ray are briefly reviewed in order to compare them with what is known of those of radium. Radium "Emits three kinds of rays, Alpha, Beta and Gamma, which differ greatly in their power of penetration, the Alpha rays being the most easily absorbed and the Gamma the most penetrating. Radium salts are unlikely to be of any service in diagnosis by means of radiographs, for if the Beta and Gamma rays are used together (the Alpha do not need consideration, as they are so easily absorbed) the radiograph shows no differentiation between the tissues; if the Gamma rays alone are used, there is a slight indication of the bones, but the re-

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sults cannot be compared for a moment with those made by the X-rays."

Williams concludes that radium is of no use as a diagnostic agent, but in therapeutics he looks for some results. He has used pure radium bromide, about 50 mgm., in the treatment of fifty cases, divided as follows: Acne (1); psoriasis (2); lupus vulgaris (5); lupus erythematosis (2); eczema (2); keloid (1); rodent ulcer (5); epidermoid carcinoma (28); breast carcinoma (4). Results—Case of acne, healed; cases of psoriasis, healed; cases of lupus erythematosis, still under treatment; two cases lupus vulgaris healed, three under treatment still; eczema did not improve; three cases rodent ulcer healed, two still under treatment; fourteen cases epidermoid cancer healed, thirteen still under treatment, one discontinued treatment; three cases of indurated nodules recurrent after breast amputation, induration lessened; fourth case being treated by both radium and X-rays, results not definite. For purposes of comparison, certain areas of the psoriasis cases, of one of the lupus vulgaris cases, and of the case of keloid, were treated by radium and certain others by X-rays. In each case the areas exposed to radium healed the quickest. The Beta rays are believed to be the active agents concerned in the healing process, exposures of forty-five minutes to Gamma rays alone not having produced irritation. Gamma rays alone are secured by enclosing the radium in an aluminium capsule, which stops the Alpha and Beta, but not the Gamma rays. As the Gamma rays are the only ones that penetrate deeply into the tissues, they only may be of service with deeply located growths, but as it has not yet been demonstrated that these rays alone can heal superficial growths their value in deeply-seated processes is entirely problematical.

Williams' conclusions are: (1) That radium is not serviceable in diagnosis; (2) Beta rays are useful in treating superficial new growths and skin diseases; (3) Beta rays heal some new growths that resist X-rays and do it more promptly; (4) pure radium salts of 1,500,000 radio-activity should be used, as those of 8,000 or considerably more are not efficient; (5) radiation from radium is uniform; (6) great care should be exercised to avoid burns.

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THE REGULATION OF THE DURATION OF EXPOSURES AND THE DISTANCE FROM THE TUBE IN X-RAY THERAPY.

Ennion G. Williams, Medical News, March 26, 1904.

From an experience of two thousand exposures Williams has evolved the following table to show the relation of effect of X-ray exposures at different distances, based upon the rule that the intensity of light varies as the square of the distance. In the first column are recorded the distances in inches; in the second the relative intensities expressed in fractions; in the third the same in decimals; in the fourth the relative intensities expressed in decimals, taking the intensity at ten inches as unity, since this is the average distance for an exposure; in the fifth are the safety limits or the duration of time during which it is safe to expose a patient without danger of dermatitis. The figures are about one-half of those required to produce a moderate redness of skin of the forearm with a tube using one ampere and 15 volts, with an equivalent spark gap in the secondary circuit of five inches. When it is desired to estimate the total amount of treatment given, the exposures which have been made at various distances may be reduced to their equivalent at 10 inches by means of the fifth column and then adding the number of minutes.

Distance.	Relative intensity.			Safety limits.
2	1	1.000	25.00	2.5
4	1/4	.250	6.25	10.0
6	1/9	.111	2.77	22.5
8	1/16	.062	1.56	40.0
10	1/25	.040	1.00	62.5
12	1/36	.027	.69	90.0
14	1/49	.020	.51	122.5
16	1/64	.015	.39	160.0
18	1/81	.012	.30	202.5
20	1/100	.010	.25	250.0

Approximately twice the duration of exposure noted in the "Safety limits" column will produce a dermatitis under the conditions noted above as regards apparatus. With reference to the X-ray treatment of deeply located growths as regulated

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by the table he says, "The difficulty in reaching them has been the danger of injuring the superficial tissues before the deep growths are affected. If we can have the rays penetrate the tissues with moderate uniformity we can then hope to destroy the deep growths. The closer the part is to the tube the greater is the difference in the effect upon the skin and the part underneath. For instance, suppose we have a growth four inches from the surface, and the surface four inches from the anode; according to our table the effect on the skin would be represented by .250 and that on the growth .062, or a difference of .188. Of course, this does not take into consideration the loss of intensity due to penetrating the tissues. If the surface of the skin be placed at 8 inches the growth will be at 12; the relative effects will be .062 and .027, or a difference of .035. With the skin at 16 inches and the growth at 20 the relative effects are .015 and .010, with a difference of .005. We thus see that the farther the part is from the tube the less is the difference between the effect on the skin and the part beneath. We should therefore place the part far off and make due compensation by increasing the duration of exposure directly as the square of the distance or by referring to the table we can determine the duration for the exposure. My rule is not to expose in ten days more than the number of minutes required to produce a dermatitis." Williams considers that the fear of burns is much exaggerated; that there is no more danger in using X-rays than in giving strychnia; both are powerful remedies and must accordingly be prescribed with judgment and within their limits.

TWO CASES OF LUNG DISEASE TREATED WITH THE EMANATION FROM THORIUM NITRATE.

Gordon Sharp, British Med. Journal, March 19, 1904.

Two cases of suspected phthisis were treated one for 14 and the other for 21 days, a sitting every day, with marked improvement as a result. The sputum of the first patient was examined with a negative result and the sputum of the second was not examined; the history and physical signs, in both cases,

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however, indicated phthisis. The second case also exhibited a marked pleuritic involvement, which disappeared after the course of inhalations mentioned and both men were able to return to work. Sharp gives the inhalations for an hour and believes that the breathing exercise involved has a good deal to do with bringing about the favorable result.

The apparatus used consists of an ordinary gas-washing bottle of 500 c. cm. capacity, with inlet and outlet tubes of glass. One hundred grams of thorium nitrate are dissolved in this quantity of water and any excess of nitric acid is neutralized by the addition of ammonia, drop by drop, which operation is suspended as soon as the first white cloud of thorium hydroxide appears. After standing for 24 hours the emanations have collected sufficiently for inhalation, and an inhalation of an hour's duration may be given from the same bottle every eleven hours thereafter. When not in use the inlet and outlet tubes should be closed with glass stoppers to prevent escape of the collecting emanations.

Sharp does not claim for the emanations a specific action or any action at all, but believes he is warranted in giving the method further trial and records the above results in the hope that others will give it a trial also.

RED LIGHT IN THE TREATMENT OF SMALLPOX.

J. T. C. Nash, London Lancet, March 5, 1904.

A series of thirty cases cared for at the Southend-On-Sea Smallpox and Fever Hospital is tabulated; twelve of them were treated under ordinary light, eighteen under red light. Of the first group, four died, one of the fatal cases being of the hemorrhagic variety; of the second group only one died and that one was of the hemorrhagic variety, which is said to be always fatal under any management. In both groups fifty per cent of the patients had been vaccinated and medical treatment was confined to the administration of about 6 grains of acetozone daily. As a rule, the vesicles did not suppurate, but when pricked with a needle there exuded a thin semi-puriform fluid, but no actual

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pus. Secondary fever was quite absent. Nash believes that prior vaccination plays the principal part in lessening the virulence of the disease, but he feels that his experience and a record of 18 cases of smallpox treated under red light with but a single death and that one a case of variola nigra, justifies the belief that the red-light treatment is of distinct benefit.

RECENT ADVANCES IN ACTINO-THERAPY.

By William S. Gottheil, Jour. A. M. A., March 19th, 1904.

The confusion at present existing in the terminology of light therapy is deplored and the statement made that "'Actino-therapy' is now the accepted designation for the method that employs the violet and untraviolet rays. The X-ray treatment is known as 'Radio-therapy,' while 'Photo-therapy' is employed for all kinds of light treatment collectively." The scope of the article is stated to be practically confined to the use of concentrated sunlight and that obtained from the various forms of the electric arc. The incandescent light baths, whatever the number of lights used or their candle power, is a sweat-bath and nothing more; the incandescent bulb lacks both actinic and penetrative power.

Gottheil does not believe that an arc lamp using less than 20 amperes and 55 volts is of much use in treating even the deeper dermatoses, and that one of double that power is necessary for the management of tubercular or carcinomatous lesions of the internal organs. By the use of a fifty-ampere arc, however, he has succeeded in causing light to penetrate the whole body and influence a photographic plate on the opposite side of it. In his opinion the lamps using the low amperages are only useful for treating the most superficial of dermatoses and that such lesions can be well treated by others means. Such lamps will give very intense surface reaction, but that does not mean tissue penetration. For instance, the Lortet-Genoud apparatus will produce a bulla in 20 minutes, but it requires fifteen minutes for it to penetrate even such a thin tissue as a rabbit's ear so as to effect a photographic plate. With a lamp of sufficient power, however, all the or-

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gans of the body can be flooded by the actinic rays. Local anæmia of the tissues is not considered necessary if the powerful lamps are used.

The actinic rays are directly and rapidly bactericidal; they induce capillary dilatation followed by a low grade of endovasculitis resulting in permanent atrophy of vascular tissues; they stimulate tissue oxidation processes and cause the formation of new connective tissue; they never produce uncontrollable burns or remote effects; hence are perfectly safe to administer.

As to results the writer believes, from his own experience and that of others, that in lupus vulgaris, tuberculosis verrucosa cutis, tubercular ulcer, postmortem tubercle, etc., the measure has been established, not only as the most eligible, effective, and innocuous treatment, but as a reliable agent for differential diagnosis. Lesions that do not react and improve under it are not tubercular. One-third and, possibly, one-half of the cases of lupus erythematosus, taking them as they come, are believed to be curable by properly applied actino-therapy. He has treated several cases of alopecia areata with very satisfactory results, a good growth of lanugo hair sometimes appearing after six seances. Birthmarks, nevus telangiectasis, etc., are reported to have yielded, the endovasculitis excited by the light leading to cicatricial contraction and obliteration of redundant blood-vessels. In epithelioma, Paget's disease, and rodent ulcer, the curative results obtained by some operators are as good as those resulting from X-ray exposures. The writer has secured good results in one case of sarcoma cutis. In rosacea fairly good results are reported, but Gottheil has found it too slow to employ alone. He has not had good results with it in psoriasis and prefers other methods of treatment in this disease.

As regards its use in the treatment of lesions of the internal organs, he says: "The only reports as yet are those of Freudenthal and Williams. The former has found that the light is a most important factor in combating the symptoms of hay fever, and a valuable adjuvant in the treatment of pulmonary

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tuberculosis. The author takes a very conservative position in the matter, as is entirely proper in view of the very limited amount of work that has as yet been done in this field."

The bactericidal and tissue-stimulating actions of light are regarded as proven, as well as its power to penetrate the body and internal organs, and the method is a promising field for further investigation.

SOME POINTS REGARDING THE EARLY DIAGNOSIS AND SOME NEW FEATURES IN THE TREATMENT OF PULMONARY TUBERCULOSIS.

W. Freudenthal, Medical Record, March 12th, 1904.

From a study of over 300 cases Freudenthal is convinced that a large proportion of the victims of atrophic rhinitis suffer from pulmonary tuberculosis sooner or later. A pharyngeal sign which he has verified many times and which he believes to be one of the earliest indications that pulmonary tuberculosis may be expected to develop, is a very pale color of the velum on both sides of the uvula, which sometimes extends over the greater part of the hard palate; this local anæmia may be regarded as the first expression of the malnutrition of the patient. In the larynx the characteristic anæmia may be looked for on the epiglottis and sometimes a few miliary tubercles are found when no lung involvement is demonstrable; pale, smooth swellings of the interarytenoid folds are sometimes visible. When these signs are all absent laryngeal examination by Killian's method will sometimes show small erosions on the posterior laryngeal wall and arytenoids. A reaction obtained with tuberculin Koch (the old) is regarded as a positive differential test.

But one phase of the treatment of tuberculosis is discussed—viz., with the so-called blue rays of light, and he believes that concentrated blue light from the electric arc is even more effective for this purpose than sunlight. His experience with it has led him to conclude that it acts as an anodyne in relieving pain; as an expectorant, the patients being able to remove thick clots of phlegm from the smaller bronchi; as a tempera-

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ture regulator for several hours after application, and as a beneficial stimulant to metabolism. It can hardly be said to exert a directly germicidal effect on the bacilli in the lungs. It also increases immensely the activity of the skin and indirectly at the same time stimulates the deeper organs.

As the intensity of the effect of the electric light applications depends largely upon the amount of oxygen present in the tissues, he tried inhalations of oxygen in conjunction therewith. This procedure seemed to increase the efficiency when the oxygen could be brought in direct contact with the lesion, as in tubercular tonsils or rodent ulcer of the face, but when the lesion was deeply seated the effect of the light did not seem to be increased thereby, and it is not probable that the oxygen reached these parts at all. He now uses rectal injections of CO_2, a certain proportion of which passes upward to the aveoli of the lungs where it escapes by diffusion and causes "A counter current of a proportionately increased quantity of oxygen." By this means more oxygen is gotten into the tissues affected and the light acts more profoundly.

Twenty-two cases have been thus treated; seven stopped treatment too soon for the formation of an opinion; eleven have showed marked improvement by increase in the appetite, better action of bowels and lessened cough, and four showed no improvement at all.

His conclusion is that rectal injections of CO_2, added to the so-called blue light applications, have given encouraging results and promise more for the future.

NOTE ON THE ACTION OF RADIUM AS AN ANALGESIC AND NERVE TONIC.

A. Darien, in a communication to the London Lancet for March 5, 1904.

Darien states that he has relieved the pain of cancer, cyclitis, and irido-cyclitis with radium of from 10 to 7,000 radioactivity, making the exposure for 2 to 3 days at a time with the specimens of low activity and for 2 to 3 hours with the higher. In two cases of convulsive neurosis wherein the attacks were taking place several times weekly, applications

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of radium for 2 or 3 days resulted in cessation of the attacks. One case of neurasthenic pseudo-ataxia was cured in 3 days by radium, he thinks through suggestion. One case of recent acute facial paralysis was cured in about 24 hours. He thinks that substances which have been rendered radio-active may prove to be just as efficient for relieving pain as radium, which, if true, will cause the treatment to be within the means of all patients.

THE EFFECT OF VIOLET RAYS ON NEBULAE.

Alfred W. Herzog, N. Y. Med. Jour., March 28, 1904.

The writer calls attention to a modification of the nebulae produced from the various nebulizers upon the market by passing it around a vacuum electrode in action. The apparatus used was designed by J. W. Hughes and may be described as follows: The vacuum electrode is situated inside of a glass capsule with a space between, one end of the capsule being open and the other sealed around the proximal end of the electrode. There is an opening into the proximal end of the capsule, just in front of its line of attachment to the electrode, to which is attached a piece of rubber tubing to connect it with the nebulizer. By this means the nebula is carried from the nebulizer through the rubber tubing into the interior of the glass capsule, where it surrounds the electrode and passes out of the open end of the capsule to the patient who is to inhale it.

When in use the electrode is connected in the usual manner to one of the Leyden jars of the static machine or one of the poles of the hyperstatic apparatus. When the current is passing through the electrode the cloud of vapor develops with much greater rapidity and in greater volume than when the nebulizer alone is depended upon for its production, and rises to the ceiling and floats around the room instead of falling to the floor or remaining in the middle regions of the room, as when the electrode is not excited.

Herzog concludes "That the violet rays sub-divide the nebula in such a manner as to cause it to be of much greater fineness.

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This in itself, without considering other beneficial effects which the action of the 'violet rays' may have on the patient, seems to me to be a discovery of some importance, as it will be conceded that the finer the nebula the easier the absorption by the respiratory organs of the medicaments which it carries."

A HISTORICAL SKETCH OF SOME OF THE SO-CALLED CURES OF CONSUMPTION; WITH A FEW NOTES ON LATER-DAY TREATMENT.

J. Edward Stubbert, Med. News, April 16, 1904.

The merits of the various methods of treating tuberculosis that have been practiced from time to time are discussed at some length, including hydro-therapy, serum-therapy, etc. Static electricity is considered a valuable adjunct to other treatment because of its strong tonic properties.

Cellular activity is increased by its use, the gastric function is improved, and absorption of both nourishment and drugs promoted. Stubbert has become convinced of this fact by subjecting patients who have previously been taking iron without the desired effect, to the static current and breeze, when a rapid improvement in the anaemic condition and general health would follow.

High frequency currents produce the following effects: "(1) Increase of pulse rate during the actual applications of the currents, especially in consumptives; (2) increase of respiration which, after a time, becomes deeper in character; (3) increase of the power of digestion; (4) on the tubercle bacilli: attenuating the virulence by stimulating them to excessive overgrowth; (5) increased action of the kidney. In his experiments on animals and men, D'Arsonval observed that the output of CO^2 was raised from 17 liters to 37 per hour, and the production of heat was increased from 79 calories to 127 per hour."

The electric arc-light is believed to possess sufficient penetrative power to attenuate or destroy deeply-located tubercle bacilli. As evidence of the germicidal power of these rays a case of empyema is cited in which there was resection of eight

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ribs resulting in a permanent fistula. The discharge contained tubercle bacilli and pus cells. Fifteen minutes' exposure to the direct rays of an arc light every day for two months resulted in complete disappearance of the bacilli from the discharge. The treatment was continued for six months and during this time no bacilli were found. Two months after it was suspended a few bacilli reappeared in the discharge. Stubbert believes that the arc light is more effective than the brightest sunlight. The X-Ray is much more powerful therapeutically than the Finsen light, and whatever the direct action of the X-Ray upon the tubercle bacilli may ultimately be found to be, decided clinical results have been obtained in some cases. A case is cited of a man forty years of age who exhibited extensive areas of tuberculous consolidation and softening in the upper region of both lungs, and cavities in both lungs. The X-Ray was applied for four months with the following results. Evening temperature fell from 103° to 100° F., expectoration decreased 60%, the pus cocci were markedly decreased but the tubercle bacilli were apparently increased, thus bearing out the statement that the first effect of the X-Ray upon tubercle bacilli is to promote overgrowth. Body weight was increased two pounds. Cavity on left side was smaller, and area of softening replaced by comparatively dense fibroid tissue. Cavity on right partially obliterated, and a portion of the softened area had entirely disappeared while that remaining was replaced by fibroid tissue. A peculiar feature of the case was that as fibrosis increased dyspnoea increased also. The patient was sent to Arizona and the betterment of his condition has persisted.

The patient's temperature should be watched while under X-Ray treatment. "The absorption of ptomaines from small areas of diseased tissue, when broken down by the X-Ray, is of no importance, but when the areas thus acted upon are at all extensive, the patient may readily be overwhelmed by sepsis and too rapid absorption."

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Current Electrology and Radiology

(Only articles relating to the above-named subjects will be abstracted.)

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET RADIOLOGIE.

Paris, France, February, 1904.

1. Treatment of Neurasthenia by Galvanization and Franklinization.—H. Thielle.
2. A Case of Contracture of Forearm and Atrophy of the Muscles Successfully Treated by the Sinusoidal Current.—H. Thielle.
3. Etiology and Electrical Treatment of Nocturnal Incontinence of Urine in Children.—D. Courtade.
4. A Case of Urinary Incontinence of Twenty Years' Standing Cured by Local Faradization.—H. Thielle.
5. Electrical Treatment of Anchylosis.—Dr. Zimmern.

1. In nine cases of neurasthenia treated by means of galvanization and Franklinization, Thiellé has had only two in which there was not perfect success. The author cites the cases, which bear widely varying characters and were of diverse etiology, as proving the potency of these currents.

2. The patient was a very vigorous young man employed on the railroad. He sustained a fall, the whole shock of which was borne by the elbow; immediate pain and contracture followed.

Various treatments such as massages, frictions, baths, etc., were followed without avail. Radiographic examination failed to reveal fracture, luxation or impaction. The forearm was fixed at an angle of about ninety degrees to the arm; the biceps and triceps were atrophied; extension and flexion were almost entirely absent; reaction of degeneration given by the muscles.

The treatment consisted in daily applications of the sinusoidal current. The elbow and forearm were placed in water; one electrode was applied to the back of the neck and two others were applied to the hand and the under surface of the forearm. The intensity of the current was increased gradually to 30 ma. and the duration of each treatment was 25 minutes.

At first the patient felt the vibrations very feebly. After the fourth application the patient felt the impulses very much

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accentuated at the back of the neck, he extended and flexed the arm more easily than at first.

After the twelfth application the arm had become again straight and he made all of the movements with great facility; the atrophy had diminished.

After the twelfth application the patient was recommended to resume light manual work with the injured arm, and after the seventeenth treatment he has resumed his entire work; the arm and the forearm have resumed their normal size and the patient has completely recovered.

3. The different etiological factors in incontinence of urine are named by D. Courtade. The author concerns himself only with those cases which are not directly consequent on some determinable disease, and refers to these as essential nocturnal incontinence of urine.

Attention is paid to the different pathogenic characteristics of the different cases which are of importance in the electrotherapeutic treatment.

All infants are not susceptible to this affection. It is in most cases hereditary and sometimes transmitted through many generations, and corresponding in most of the cases with a definite neurosis. The following general types are mentioned:

A. Muscular anatomical deficiency, generally referable to faulty development of sphincter.

B. An atonic condition of the internal sphincter which causes the external sphincter to fail to contract sufficiently.

C. The faulty action of the closing of the bladder is augmented by the heavy sleep which generally accompanies these small nervous illnesses. While the sleep of infants is always more or less profound, in these cases it is always markedly so.

D. Among the many occasional less important causes are congestion of the venous plexus about the bladder, the position of the child in sleep, constipation, lesions such as polypi, etc.

The treatment by electricity is one of the most rational of all of the means at our disposal. Given the pathology of the case the treatment should be to restore to the external or the internal sphincter, as the case may be, the tonicity which it lacks. Generally, to restore the general equilibrium of the parts, operating on the membraneous portion of the sphincter locally.

By preference are chosen the induced currents from a secondary of coarse wire, these currents operating generally more intensely upon the contractibility of muscular tissue. The inter-

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ruptions should not exceed two or three per second and the length of the seance should be five or six minutes. Three sittings per week, though at first each day will be better. Galvanic currents may not be used internally for the purpose of cure for the reason that they may produce dangerous escars in the urethra.

In cases where on account of extreme tenderness, it is impossible to introduce the electrode into the urethra, one electrode may be applied about the external meatus and the other upon the perineum.

If one wishes to use the galvanic current the negative pole is placed on the perineum and the positive on the lumbar region. A current of ten to twelve ma. is passed for ten minutes, care being taken that the electrode does not produce dangerous escars. The interruptions should be slow. In cases of extreme vesical sensitiveness it would be better to apply the positive pole to the perineum and pass a continuous current of eight to ten ma. for a period of five or six minutes.

The sphincters may be acted upon reflexly by applying to the abdominal walls the Faradic current from a coil of fine wire with rapid interruptions, or the patient may be placed upon an insulated stool and static sparks applied to the lumbar region.

4. This case is reported by H. Thiellé, complete cure resulting from treatment by local Faradization.

5. Treatment of ankylosis by means of the continuous galvanic current is discussed by Zimmern. In general, cases that are not absolutely anchylosed, or in other words simple stiffness of the joint, vestiges of an old dry or gonorrhoic arthritis, or remains of an old prolonged immobility, are susceptible of cure by the action of the continuous current.

The method has the advantage of not provoking any pain either during the application or thereafter. It consists in causing to pass through the affected joint a current as intense as possible, all the time respecting the continuity of the integument. It is of the utmost importance to place the negative pole as near to the articulation as possible.

The current should be at least forty ma. and about three seances per week are all that may be given. It is impossible to avoid a slight baking of the skin and desquamation at the points of application of the electrodes.

The number of applications will vary greatly with the individual case.

The nature of the case and its suitability for this form of treatment may be readily determined by an X-Ray examination.

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ARCHIVES OF THE ROENTGEN RAY.

London, Eng., March, 1904.

1. Lectures to Medical Practitioners on Physics Applied to Medicine. Lecture I. On Rays in General.—Oliver Lodge.
2. Improvements in Induction Coils and Resonators.—Leslie Miller.
3. The Revelations of Radium.—George B Batten.

1. In this lecture the author calls significant attention to physics as the foundation of all science, both therapeutical and applied.

Of the many departments of physics which are important in their applications to medicine, electricity and radiation are at present holding the chief attention.

There are discussed the various rays of which radiation in general is made up, especially cathode rays, X-Rays, radium rays, infra-red, ultra violet, light, and lastly the N-rays of Blondlot, which are causing so much discussion in the literature of pure science. Lodge expresses himself as somewhat sceptical about them, but admits that if they do exist they may be the most important of all.

The various physical ways of generating these different kinds of rays and of using them in surgery and medicine are explained; also the properties of each.

The great importance of Lenard's work just preceding Roentgen's discovery is urged and the use of the electrometer as a means of comparing X-Ray intensities from different sources is explained.

3. This semi-popular lecture presents a very interesting collection of facts about radium and its various rays, emanations and residues; as well as a brief history of the development of this most important branch of physics.

The use of conventitonal physical terms is not a little unusual, in several places suggesting at once that the writer is not a physicist, though the general treatment of the subject is very entertaining and in the main accurate.

The courage with which Dr. Batten states that "Probably polonium and actinium do not really exist, but are bismuth rendered luminous and radio-active" is a little startling, though perhaps some of us are more than half inclined to agree with him.

The diagrams showing how a radium atom may break up and how therefrom helium atoms may be formed are very instructive.

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JOURNAL OF ADVANCED THERAPEUTICS.

New York, April, 1904.

1. Currents of High Frequency, Apparatus and Therapeutic Uses.—F. G. DuBose.
2. A Plea for Electro-Therapeutics Proper. (Concluded.)—W. J. Herdman.
3. A New System of High Frequency Therapeutics. (Continued.)—F. F. Streng.
4. Methods Used in Radiography.—R. H. Boggs.
5. Radiant Frequency Transformation or Fluorescence.—Margaret A. Cleaves.
6. Report of the Committee on Current Classification and Nomenclature. (Continued.)
7. On the Physic-Pathological Action of the High-Frequency and High Tension Currents on the Normal Skin. Histological Researches. (Concluded.)—Dr. G. Areinzo and Dr. S. Fabrozzi.

1. The "High frequency" currents are considered to be the coming electric modalities and the structure of the apparatus by which they are generated as well as the different steps by which the current transformation takes place are exhaustively described. The auto-condensation couch, by the use of which the patient is made alternately the positive and negative side of the condenser, gives the most powerful therapeutic effects, which are tonic and eliminative generally, and sedative to the nervous system. The bacillus of blue pus is killed after half an hour's exposure to the currents. The only sensation experienced by the patient is a feeling of drowsiness. [In our experience this effect is not uniformly produced.—Ed.] Marked benefit usually and sometimes cure is stated to have followed the use of the auto-condensation couch in pulmonary tuberculosis, neurasthenia, dyspepsia, anaemia, chlorosis, neuritis, sciatica and headaches. The intra-vaginal application of the high frequency current through the glass vacuum electrode will remove post-operative pelvic pain, ovarian neuralgia, menorrhalgia, congestive pelvic conditions not caused by gross lesions. Its local application is frequently curative in eczema, furuncles, acne, pruritus, and varicose ulcers, being superior in the latter condition to the static modalities. Du Bose also believes that it will in most cases replace cocaine for local anesthesia and the knife in the management of hemorrhoids.

2. Herdman deplores the extreme manner in which electrotherapeutists have neglected electric modalities proper during the last two or three years for the X-Ray, electric light, mechanical vibration, etc. While acknowledging the value of these new therapeutic forces, yet he considers that a too enthusiastic exploitation of these "Border-line" elements of therapy is calculated to bring an undeserved distrust upon the older elements of electro-therapy.

He describes the physical properties and physiological actions of the different electrical currents, showing that by a

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proper differentiation in their use and a requisite degree of skill in their application, there can be produced physical effects for which the employment of a large number of drugs or surgical measures would be necessary without it, and these effects are usually produced much better by the properly selected and applied electric modalities than by any other measures. In connection with electrolysis, the most useful of all the attributes of the continuous current, he describes a case of osteo-sarcoma of the superior maxillary bone involving the whole of the alveolar arch and extending upward so as to encroach upon the antrum and inward to the median line of the jaw so as to displace the tongue to the left side and back part of the oral cavity. The condition was absolutely hopeless as far as treatment with any other than the most radical of surgical measures was concerned. During the following six weeks he received six applications of electrolysis by means of gold needles thrust into the margin of the growth to the depth of one inch in some places and afterward into the center, which needles were made the positive pole of a 15-milliampere current, with a treatment duration of 5 minutes. A 2% cocaine solution was applied to the mucous membrane before the needle was introduced; the pain was never unbearable, there was no blood shed, and the patient was not detained from his business. At the end of three months after the first treatment the patient was to all appearances entirely well, Dr. Herdman exhibiting a photograph of the condition at that time.

4. Accuracy is the basis of successful radiography. The operator must be familiar with every part of his apparatus and particularly the tube, which is an exceedingly delicate part. The tube which is exactly focused, which will give a light that easily penetrates the chest and which has such a low internal resistance that it will not back up a parallel spark of more than two inches; is the one which experience has shown will give the best results.

The time of exposure and development is very important. With a powerful coil and a good tube it is not necessary to make an exposure of over thirty seconds for any part of the body, and in chest work the time need not exceed a second unless the patient weighs over 140 pounds. The following developer formula works well: Water, 1 qt.; edinol, 2 drams; hydrochinon, 3 drams; acetone sulphite, 2 oz.; potassium bromide, 1 dram; potassium carbonate, 6 oz.

5. Cleaves states that the action of phosphorescence may be likened to that of an electric transformer in that it reduces

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radiant energy from a high rate or frequency to a lower. The waves that we recognize as light do not differ from those of electricity excepting in their frequency and length. High frequency electricity as employed in medicine to-day is closely related to light in a physical sense and as light is the basis of all life on this earth, the connection is obvious.

There are many fluorescent substances known, but the most important to the medical profession is the human blood. The fact that the blood is fluorescent explains, to the author's satisfaction the response of the human organism to radioactivity. Thus in malaria, the blood loses its fluorescent property but on the addition of quinine to the blood the fluorescence is restored and the disease eliminated.

In conclusion the author states that to intelligently observe the different phenomena requires that the physician be at the same time a physicist.

6. This report was presented at the annual convention of the A. E.-T. A. in September, 1903, and cannot well be abstracted Copies may be had from Mr. W. J. Jenks, 120 Broadway, New York, chairman of the committee.

7. Arienzo and Fabrozzi have carried out a series of experiments on rabbits to ascertain what histological changes are produced in the skin by the application of the effleuve from the Oudin resonator and the high frequency spark. The apparatus used was a large Ruhmkorff coil giving a spark fifty inches long, provided with a rotary mercury interrupter which was put in communication with the armatures of four large Leyden jars, a large D'Arsonval solenoid and a resonator of the Oudin type. The treatments were applied for twenty minutes each to different parts of the skin and a variable number of times. After the effects of the treatment had had time to become thoroughly established, sections were made through the areas treated and examined microscopically. It was found that the epithelial elements of the skin were the most powerfully influenced, active hyperaemic changes taking place in the surrounding areas, with exfoliating scabs as end products. The conclusions are recapitulated as follows: The repair of lesions produced by the treatment takes place by a process of leukocytosis and phagocytosis in the subcutaneous tissues, resulting in the complete regeneration of the epithelial strata of the skin. The regeneration of the epithelium progressed as in all processes of cicatrization. The authors conclude that from a cosmetic standpoint it is better to use these currents than the knife or cautery when it is desired to destroy any portions of

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the skin, and it is suggested that the predilection on the part of these currents for the destruction of epithelial elements may be significant when considered in connection with their employment in the treatment of cutaneous epithelioma.

AMERICAN X-RAY JOURNAL.

Chicago, March, 1904.

1. Value of X-Ray and Electro-Diagnosis in Medico-Legal Cases.—John E. Kehoe.
2. Cutaneous Hypertrophies.—H. Perkins Fitzpatrick.
3. Dangers to the X-Ray Operator. (Concluded.)—John T. Pitkin.
4. Electro-Therapy. A course of twenty-four lessons under the auspices of the Chicago College of X-Ray and Electro-Therapeutics. Lesson 10—Application of Static Currents.
5. Some Experiments and Conclusions in Hypnotic Therapeutics.—W. H. Wallace.

1. The value of the X-Ray from a medico-legal standpoint is discussed and illustrative cases cited. In one a man had sustained a fracture of the femur and claimed damages because union had not taken place; X-Ray examination demonstrated that his contention was false, good union being found. In another damages were asked for because of asserted failure to reduce a hip joint dislocation; skiagraphs demonstrated that reduction had been secured. In getting at the truth when hysterical conditions are present, the agent is considered of great value.

2. Fitzpatrick treats hypertrichosis by inserting a needle into the hair follicle and connecting with the negative pole of a galvanic battery using from 1 to 3 ma. of current according to the sensitiveness of the area treated. To avoid pain the current should not be turned on until after the needle has been inserted into the follicle. From 60 to 70 hairs can be destroyed in an hour. Angiomas can frequently be removed in from 3 to 7 treatments by successively transfixing different areas with a single needle until the whole growth has been treated, and passing through it a continuous current of from 4 to 6 ma. making the needle alternately of positive and negative polarity. Nevus pigmentosus is cured by transfixing the elevated tissues and using 2 to 4 ma. of continuous current negative polarity; cutaneous horns are amenable to this same procedure. Tattoo marks, chloasma, lentigo, small fibroids, cysts and all warty growths can be entirely removed by electrolysis. The method is regarded as firmly established in the management of many blemishes and as offering much in the way of future possibilities.

3. See this journal, issues of December, 1903, and January, 1904.

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Archives of Electrology and Radiology

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Original Contributions.

THE HIGH-FREQUENCY CURRENT WITH THE GLASS VACUUM ELECTRODE AS AN ADJUNCT TO THE X-RAY.*

By May Cushman Rice, M. D.,
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Professor of Clinical Electro-Therapy at the Illinois School of Electro-Therapeutics, Etc.

All electro-therapists admit that the coil gives a greater amperage than the static machine, but the spark discharges of the latter give a greater number of alternations than the former, while the high-frequency coil gives a still greater number of alternations. Electro-therapists in general recommend the high-frequency coil as the proper energizer for the glass vacuum electrode, but results can be obtained with the static machine alone, and in my experience the results compare favorably with those secured when the high-frequency coil is placed in the circuit.

William Benham Snow in his late work on Static Electricity says: "There is undoubted advantage in some cases in the treatment of which a stronger chemical discharge is beneficial, from the greater amperage of the coil. On the other hand, the positive vibratory effect of the static high-frequency which is easily appreciated by holding an electrode in the hands has its advantages in overcoming local stasis and congestion." This latter action, combined with its antiseptic and germicidal properties, accounts for the prompt results in most of the cases treated.

My attention was first called to the use of the high-frequency current in connection with the X-ray after treating a rodent ulcer for three months with the X-ray without effecting a cure. Similar cases had responded promptly, but to my surprise this

*Read before the Chicago Electro-Medical Society, Feb. 23, 1904.

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one refused to yield. Dermatitis was produced several times, whereupon rest was given between treatments until the dermatitis had subsided. Each time as the lesion appeared to be almost healed, it broke down again and discharged freely. Becoming quite discouraged with the X-ray for this case, it occurred to me to try the effect of the high-frequency current applied by means of the glass vacuum electrode. I grounded the positive conductor and connected the glass electrode to the negative according to the method suggested by Snow. There was marked improvement from the beginning and four treatments effected a cure. There is now practically no scar tissue to be seen.

Case II. Epithelioma. Mr. B., aet 78; presented a growth below the left eye of about the same size as that of case I. It had developed slowly, having been present for about ten years, at first a warty growth, of late very sore and ulcerating.

Because my static machine was not working sufficiently well for a good X-ray, on account of the humidity of mid-summer, and because of my success in the case above mentioned, I gave this patient both the X-ray and high-frequency current at the same sitting. After five treatments on successive days, there was so much reaction that the treatments were discontinued. In one month without any further treatments the growth had disappeared, leaving a healthy skin.

Case III. Mr. H., aet 52. Three months before consulting me a growth had appeared on the lower lip. He at first thought it a fever sore, but it had persisted so long and had become so very tender he became alarmed. It had the characteristic appearance of a malignant growth, but there was no glandular involvement. With the X-ray, followed by the high-frequency current, a dermatitis appeared after the sixth treatment. Four more treatments were given at longer intervals. As the dermatitis subsided the growth disappeared, but a sufficient time has not elapsed to state whether more treatments will be necessary or not.

Case IV. Mrs. A., aet 48; had a growth below the right eye of two years' standing very similar to cases 1 and 2. The X-ray alone was used every other day. Twenty-one treatments were given before a dermatitis set in. Then the glass vacuum electrode was used and the case progressed to a cure. It is to be noted that in this case when the X-ray alone was

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used, twenty-one treatments were given as compared with five in case 2, in which the X-ray and high-frequency were used at the same sitting.

Case V. Mrs. G., aet 72. Epithelioma on the edge of the concha in the form of a wart with a characteristic crust. This growth which had been present for about a year and a half had been treated repeatedly by electrolysis, but had speedily recurred each time and was extremely sensitive to pressure. After 11 treatments, the X-ray and glass vacuum electrode both being used, the growth came off in a mass. Owing to the patient's fears that it might recur, due to her past experience, three more treatments were given.

Case VI. An old lady with an epithelioma on the back of the hand, of three years' duration. It presented black scabs and was ulcerating in three places. After two months' treatment with the X-ray it was apparently cured, although it remained sensitive and showed a tendency to recur. At this time I was treating case I, my success with which led me to try the high-frequency current. As before, the soreness was relieved and the hand soon restored to its normal condition.

Case VII. Mr. K. Epithelioma of the lip with glandular involvement of the neck. He had had two operations on the lip and one on the gland. At the last operation on the lip an inch and a half of tissue was removed. When he came for X-ray treatment he was in a very bad condition. A papular growth was present on the lip at the site of the scar, the neck was badly swollen, hard and painful, and was freely discharging pus. The case, apparently a very malignant one, three operations having been performed in six months, responded well to X-ray treatment, this only having been used. The lip healed, the pain in the neck was relieved and the gland decreased in size until at times it could scarcely be felt. Whenever treatment was discontinued for a time, however, the gland would swell and discharge again. For one year the treatment held the growth in check, but then it seemed to lose its effect. The pain returned and the patient, discouraged, decided to go to a cancer specialist, and is, I understand, not improving. An unfortunate feature in the case was the fact that he did not acquire tolerance of the X-ray, but became more sensitive to it, so that it was possible to give only two or three treatments two or three days apart before dermatitis would result.

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All that the high-frequency current did for him was to assist in clearing up the dermatitis and in relieving the pain during the last few weeks of treatment.

In a case of sarcoma of the lower jaw the glass vacuum electrode was very useful in relieving the pain after dermatitis had developed. In similar cases I have found it advantageous in that it relieved pain, enabling me to continue with some form of treatment, and by assisting the dermatitis to subside made it possible to resume X-ray treatment earlier.

Case VIII. Miss F., aet 29. Referred to my clinic at the Illinois School of Electro-Therapeutics with a diagnosis of lupus erythematosus. She had had eleven X-ray treatments. There were patches on both sides of the nose and on the border of the scalp, characteristic sites for this disease. Fourteen more X-ray treatments were given when a dermatitis developed and the high-frequency current was substituted for the X-ray. The case has done so well under this latter treatment that the high-frequency current has been continued, 12 treatments given, and now it presents pinkish white scars level with the surrounding skin. There is still a slight tendency to scale in the center and the treatments will be continued for a time. Compared with other cases of lupus erythematosus reported, this is a good result. Williams mentions a case in which a good result was obtained after eight months.

The physiological actions of the high frequency currents when applied with the glass vacuum electrode are to relieve congestion, improve nutrition, stimulate the circulation, produce sedation and combat infection through the large amount of ozone generated at the surface of the electrode and make it an agent of inestimable value in the treatment of the various diseases of the pelvic organs. The fact that the vaginal electrode is so easily introduced and that the amount of current sufficient for the best results is never painful, but, on the contrary, soothing, gives an additional value to this mode of application. The latter advantage is well illustrated in the following case:

Case IX. Miss H., aet 33; had engaged in running contests at which she carried off the laurels. This was the only apparent cause for a most severe inflammation of the pelvic organs. She had suffered for more than a year from amenorrhea, dysmenorrhea, and a highly nervous condition, and had also had chronic appendicitis for four years. An examination made

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with the greatest of difficulty disclosed both ovaries cystic, five or six times their normal size, very low in the cul-de-sac of Douglas and exquisitely tender. This extreme tenderness extended throughout the uterus and there was a profuse discharge seemingly from both uterus and vagina. The patient had been under various kinds of treatment, but had failed to improve to any marked extent. Copper electrolysis had been tried per vagina, but caused so much suffering both during the treatment and for several hours after it had been abandoned. The patient was then referred to me. Perplexed as to how I should be able to manage the case, I determined to try the glass vacuum electrode. Between the vaginismus and the inflammation, it was impossible to make a satisfactory examination. At first I could not insert the electrode, but by applying the current externally a few minutes sedation was produced and the electrode slipped in. At the end of five minutes I was able to make a much more satisfactory examination. After eight or ten treatments there was marked improvement, so much so that physicians who had previously treated her were astonished at the results. After about two months' treatment the local condition was so much better that it was decided to operate for the appendicitis, which still persisted. At the time of the operation upon the appendix the surgeon would have removed the ovaries, but the patient did not take the anaesthetic well, and he did not dare prolong the operation. As soon as possible she resumed the treatment, and now after two months the ovaries have been greatly reduced, and are gradually being induced to approach their proper position, although at the time of the operation for appendicitis it was prophesied that there was no possible way of preventing the removal of those ovaries. The patient is feeling well and is working hard at a laborious occupation every day. I have chosen to give the history of this case in full rather than mention several other cases of a less serious nature, which have yielded in a surprising manner to this treatment.

Case X. Mrs. G., aet 65. Had had almost constant pain over the region of the bladder for about four years and some pain in the course of the sciatic nerve. She told me that several physicians had diagnosed her case as catarrh of the bladder. Examination of the urine proved negative. The Morton wave current with block tin over the sciatic nerve re-

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lieved the pain there somewhat, but that over the bladder persisted. Although the patient objected, as she had been previously told that the condition was normal, I then made a pelvic examination. I found a state of things not uncommon in elderly women, especially those who had been subject to inflammations in earlier life, that while the fundus had atrophied there was still a very sensitive congested cervix. I applied the positive galvanic current to the cervix by means of a copper electrode. At the next visit the patient reported no improvement. I then used a glass vacuum electrode and told the patient to return in three days. She did not appear for a week, and I did not expect to see her again, when she returned and reported that she was a great deal better. She had a long distance to travel and could get to the office only once a week. However, she continued to gain and few treatments were required to complete the cure. In other cases I have noticed a relief of irritation of the bladder and also a tendency to relieve constipation, both of which are so often found in connection with inflammations and misplacements of the pelvic organs.

Another field of usefulness for the glass vacuum electrode is found in the painful affections of the peripheral nerves, though it should be remembered that while the first effect is sedative the pain is temporarily increased if the application be unduly prolonged or too much localized.

Case XI. Miss A., aet 40. Subject to severe attacks of migraine of hereditary type, has experienced marked relief after curettage of the uterus and taking the rest-cure. In spite of the general improvement she had been suffering for six or eight months with a cervico-occipital neuralgia, the one thing that prevented her feeling perfectly well. The sedative effects of the treatment were evident from the first. Perhaps a dozen treatments were given before there was a complete cure. The patient had been suffering from hot flashes due to a premature menopause and these were relieved.

Case XII. Miss P., aet 30. The patient, a school-teacher, has suffered for several years with pain in the epigastrium, extending around the ribs and down the back. At times the pain was very severe, came on suddenly and was independent of taking food; diagnosis, gastralgia; treatment, the glass vacuum electrode applied as before. Nine treatments were given. Sometimes there was relief for a few hours, then a return of the

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pain, and at other times there was practically no relief. It was quite difficult for the patient to continue the treatment on account of the distance she had to travel after school at night, so after the ninth treatment she discontinued. Several times after that she sent me word that she was very much better and that she felt that the electricity had done her a great deal of good. A few days ago, now about six months since discontinuing treatment, she informed me that she is again suffering and will return.

Case XIII. Miss S., aet 22. Of a tubercular diathesis. Had an operation ten years ago for tuberculosis of the knee-joint. Since then she has developed an infective endocarditis following a sore finger. About a year ago I had successfully treated a gland in the breast, apparently tubercular. About six months ago she fell from a table and hurt her back in the dorsal region, had suffered pain ever since. Tuberculosis of the vertebrae would have been a natural sequence. However, the pain was relieved by eight applications from the glass vacuum electrode.

Chronic eczema has been cured with only four or five applications such as those previously mentioned. Acne vulgaris and itching skin diseases have responded in a remarkable manner and intense pruritus has been relieved for 24 hours after a single application. Fissures produced on my own hands as an X-ray operator yielded to two treatments, while fissures from other causes have done equally well. Boils have been aborted, typical attacks of migraine quickly dispelled by moving the electrode with a mild current over the affected nerve.

The field for the high-frequency current with the glass vacuum electrode, whether energized by the high-frequency coil, resonator, or static machine alone is a broad one, the best evidence of which is that though not new it is becoming more and more recognized as a therapeutic agent by the open-minded of the medical profession.

DISCUSSION.

Dr. Burdick asked that the method of connecting the vacuum electrode be demonstrated to the society. Dr. Rice then tested the static machine for polarity, grounded the positive and connected the glass vacuum electrode to the negative. The balls were at first in contact and were afterwards separated for a

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quarter or one-half of an inch until the current within the glass vacuum electrode seemed to be at a maximum.

Dr. Neiswanger then asked Dr. Burdick if there was any difference between the discharge thus obtained from a static machine and that from a high frequency coil.

Dr. Burdick replied that the current in the static machine is unidirectal. The oscillations between the balls of the electrode produce a succession of impulses, and here we do not get the destruction of nitrogen and the liberation of ozone as we do with the high frequency coil. In this latter apparatus we get a rapid to-and-fro oscillation, as the current shows no special desire to follow the electrode, but may prefer to travel through the atmosphere.

Nicola Tesla had carried on experiments with these oscillatory currents to a degree far beyond any other physicist. He changed a 110-volt alternating current of 60 cycles to 275 trillion vibrations, and with these immense oscillators he obtained a flame 68 feet long, in which even the nitrogen of the air will burn. This is, of course, too powerful for therapeutic purposes.

The body protects itself by acting as a condenser. However, currents of a number of amperes can be sent along the body without any sensation, due to the high voltage rendering the body a conductor. The molecules of the body are set into very rapid vibration, but the electricity leaks through the floor, thus keeping the distribution of the body electricity at an equilibrium.

With the Tesla coil, the molecules are whirled half forwards and backwards. Condensers are used with this coil adapted to the capacity of the machine. Dr. Burdick had used the static machine alone in the manner recommended by Dr. Rice and had discovered that this treatment has a medicinal value of its own.

Dr. Neiswanger asked what is the difference between the Ruhmkorff coil and the Tesla. Dr. Burdick replied that there is a higher molecular vibration in the Ruhmkorff coil. The amperage output is too high for the average practitioner to use. Great care must be exercised in order not to give the patient uncomfortable sparks. He connected the vacuum electrode to one pole of the Ruhmkorff coil and showed how the discharge excited the electrode.

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Dr. Coleman asked the difference between the Tesla coil and the Oudin resonator. Dr. Burdick replied that they differed in the amount of wire, size of conductors and the amount of air enclosed between the conductors. He drew a figure to illustrate, showing a coil of wire wound on a vertical drum, the lower part being a large wire and the upper part continuous with the lower and the small wire of one-quarter size, the other in circular mills. It is thus really a choke coil. One end of the large wire is connected to one of the condensers below and the other condenser is grounded. The spark gap is arranged between two small electrodes connected with the internal coatings of the condensers. The amount of atmosphere included between the layers of the large coil on the vertical drum giving rise to a turmoil, and the molecules revolve rapidly. A to-and-fro current results. The Tesla coil has its secondary enclosed within the primary. The frequency, voltage and amperage are therefore less than for the Oudin, which has the advantage of a greater amount of wire. The coils of wire are sufficiently insulated by the self-inductive force of the high-frequency current, while in the box of the Tesla coil great difficulty is experienced in properly insulating the coils from each other.

In the East, Dr. Burdick had seen in the factory of Otis, Clapp & Son, that the high-frequency current would pass readily through four inches of solid glass. An electrode was placed on one side of this glass and just as good a spray could be obtained on the other side as from the electrode direct.

In the Ruhmkorff coil not 40 per cent of the initial energy is transformed. There is a great loss from the magnetic lines of force passing clear out of the apparatus. As usually constructed there is a neutral zone where there are no lines of force. By using the closed type of transformer, as in altering the voltage of the street current for illuminating incandescent lamps, there is little loss. Dr. Burdick then explained the usual alternating transformer where the coils of wire are entirely enclosed by soft iron. If such a transformer could be used for therapeutic purposes, barely 2 per cent would be lost. There is need of some such transformer for the high frequency instead of the other type.

Several years ago, when lecturing on physics, Dr. Burdick made an Oudin Resonator by winding wire on a bass drum.

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He had some difficulty in properly tuning this and had transformed a current of 104 volts, 133 cycles, to 40,000 volts, and had charged two brass plates facing each other, but near together. From this he obtained some truly marvelous phenomena. He could change the resonance of these two by shifting the conductors a little. A bar of steel when placed between these two plates would almost immediately become liquid. The metallic tin would fairly explode like gun powder. Other metals could be melted as readily. When his own body is placed within the field he was not conscious of any feeling, the human body protecting itself by acting as a condenser and was thus saved from destruction. In one of his lectures he had a whole string of incandescent lamps, which he would light up when in actual contact with his body, showing that a current powerful enough to light these made no sensation when passing through his body. In one of his lectures he had a peculiar experience. For the benefit of some of the audience he performed these experiments a second time, and although he felt no effect from the current, he was afterwards much exhausted and seemed to be almost paralyzed for a number of hours.

The Ruhmkorff coil does not utilize more than 40 per cent of the energy put into it, because of the magnetic leakage. As a transformer, it is altogether inferior to the power transformers for alternating currents. In these, the magnetic core is made of laminated iron in the form of a square, so that the lines of magnetic force do not at all have to pass out into the air. The secondary windings are enclosed within this and thus receive the full effect of the energy of the primary. Hardly 2 per cent of the energy is thus lost.

Dr. Coleman asked about the technique employed, saying that he had tried the X-Ray and high-frequency treatment combined, in one case. His first experience in the use of the X-Ray was in the application of the treatment to granular lids, and he believed that this preceded the work of others in America in that field. He had used a high tube with strong current in primary at a distance of 12 inches three times per week. Tube backed up a 3-inch spark gap. He now uses no protection for the face or eyeball, as the lid will show a reaction before any of the ocular tissues. He treated a neurasthenic who was so nervous that she could not use her eyes for reading or sewing, and she could hardly bear to listen to

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anyone talking. She had a good deal of spinal irritation and was unfitted for any kind of housework. After a few treatments she was so far improved in general health that she was able to do the family washing. The eyes, however, did not improve. He used a glass vacuum electrode connected directly to his Ruhmkorff coil, applying the treatment to the spine, but now has a high frequency apparatus which he means to give a thorough trial.

Mr. Treadwell asked whether the jars could not as well be used, and he connected the glass vacuum electrode to one side of the machine with the jars on. It was found that there was very little difference from the use of the machine without the jars. Theoretically, the jars would give a more pronounced oscillatory discharge than when they were not used.

Dr. Neiswanger felt that the discussion thus far had been limited to the physical aspects of the paper, whereas the therapeutic results certainly deserve a very thorough discussion. He felt that although we have at our disposal these new forms of treatment, we must not neglect the well-established currents which have proved so efficacious in chronic conditions due to inflammation. He had used a glass vacuum electrode in several cases, which had done well under the treatment, but he is not at all sure whether they would not have responded as readily to galvanism.

A keloid of 15 years' standing in a man of 65 years. It had been operated upon and was very painful because pressing on nervous tissue. It has received about 150 X-Ray treatments and had been quite severely burned. He tried the high frequency with the glass vacuum electrode with some relief at first, but the patient returned nearly overcome with pain, saying that when the pain did return it was ten times as bad. He then tried vibratory massage and after a number of treatments the patient felt better than for a number of years.

In closing, Dr. Rice said that she had by no means discarded the use of copper electrolysis, though she had found that where there was a great deal of tenderness the patients did not always endure it well. The case mentioned above was an example of this, copper electrolysis having been tried, but was abandoned because it occasioned so much suffering, while relief had been obtained under the high-frequency current. She had found that in painful affections, short treatments of from

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3 to 5 minutes' duration produced sedation, while longer treatments were inclined to cause a return of the pain. Several cases which had come to a standstill under the X-Ray had progressed to a cure under the high-frequency current.

Replying to Dr. Coleman in regard to her technique in the use of the X-ray for the superficial cases mentioned, she stated that a tube of low vacuum crossing the line at a spark gap of one inch or less was used, the tube distance at the first treatment being 6 inches. After toleration was assured, the distance was decreased to 3 inches, continued at 3 inches until a slight dermatitis was produced, then again increased or the treatment discontinued for a time.

Unless the patient is limited as to time, she prefers to give the treatments every second day rather than daily, it being safer and producing as satisfactory results.

The high-frequency current in conjunction with the X-Ray had in some instances apparently prevented a dermatitis and proved a most valuable adjunct to the X-Ray.

THE CARE OF STATIC MACHINES.*

By H. E. Waite, M. D.

Of New York, N. Y.

Instructor and Demonstrator of Electrical Apparatus at the New York Post Graduate Medical School and Hospital.

At present there are three types of influence or static machines used in medicine, viz., the Holtz, Toepler-Holtz and Wimshurst. The two first mentioned are more generally used. The Wimshurst has been on the market several times, but not having realized expectations, owing to its construction and its lack of uniformity in generating current has proved a failure.

The following remarks concerning the care of static machines will be found applicable to either type, as the principles involved in both are essentially the same.

A general misunderstanding prevails concerning the cause of the trouble which will at times occur with even the best static machines. The difficulty is variously ascribed to rainy weather, dampness and kindred causes, whereas the fact is that the arch enemy of the static machine is *vapor*, and to this cause almost entirely may be attributed the failure of a machine in otherwise good condition to accomplish (during the muggy weather of July and August) that which is expected of it.

*Read at the Fourth Annual Meeting of the American Roentgen Ray Society, at Philadelphia, Pa., December 10th, 1903.

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With this in mind, the owner of a static machine will at once realize how essential it is to keep his machine free from vapor by judicious cleaning and by having the case air-tight; or, if the disturbing element has already gained entrance, to take such steps as will speedily rid the machine of the causative factor in the trouble.

If, from any cause, vapor has accumulated inside the case, I would suggest, in order to remedy the matter, that two or three fruit jars be filled with cracked ice and rock salt (one part of rock salt to two of ice), the covers screwed down tightly and the jars placed on saucers in the case of the machine, the doors of which should then be closed. At the expiration of about fifteen minutes frost will be found about half way up the jars and some water in the saucers. The jars and saucers should then be taken out, wiped dry and replaced, the operation being repeated three or four times, or, if the machine as well as the day be very damp, it may be necessary to repeat the procedure five or six times, always being careful to close the doors. The jars having been finally removed from the case, chloride of calcium should be placed therein and the doors closed at once, when in a short time, the machine will charge without any further difficulty. Should it for any reason be deemed necessary to open the door, it will be found that running the machine during this period will, to a certain extent, prevent the condensation of vapor upon the plates.

Right here it might be well to mention the various materials that have been placed inside the cases of static machines to serve as dryers. These are sulphuric acid, sulphuric acid and pumice stone, powdered chloride of calcium and quicklime in lumps unslaked. While all of these have been used and a number more, my preference is for well-baked chloride of calcium on account of its quick action. This should be baked in an open dish over a red-hot stove until bubbling ceases and no evidence of moisture is apparent. It should be used only when cool. I have also found quick lime in lumps quite effective, but as soon as it crumbles into fine dust it should be removed, as the dust will rise and settle on the parts of the machine, and while no harm is done it does not add to the machine's general appearance. The lumps can be placed in jardinieres or wooden boxes made to fit the available space and

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covered with close mesh fly netting to prevent the escape of the dust.

An important point in the care of the static machine, and one I cannot too strongly impress upon your minds, is the necessity of keeping the machine absolutely clean. Not only should the front of the case be carefully looked after, but the prime conductors, rubber insulation, brass balls and everything about the machine should be rubbed clean and bright every day, eternal vigilance as to cleanliness being requisite to ensure a perfectly-working machine. For this purpose no extensive paraphernalia is required—merely a piece of cheese-cloth with a little vaseline rubbed in (not enough to be sticky), and with this the prime conductors and other parts can be kept clean and shining.

As to the plates of both machine and charger they may be cleaned with kerosene oil and then rubbed dry with cheese-cloth and vaseline. This may be required once or twice a year.

The brushes of the Toepler-Holtz machine need frequent looking after. They may be easily cleaned by rinsing them in a solution of caustic potash, then washing in hot water and allowing them to dry. This will remove such dirt and oxide as may have adhered to them, and the brushes will then be as good as new. Kerosene will also clean the buttons or sectors.

It is also important to keep the glass legs of the insulated platform clean. The tendency of the machine when working is to attract particles of dust from the atmosphere as has doubtless been noticed by many of you; this, taken in connection with the vapor that is deposited on the pole pieces and the legs of the platform, may (when the platform is connected with one of the prime conductors, the other being grounded), short circuit the machine.

The following will doubtless be recognized as a familiar proceeding on the part of the physician owning a static machine, when for any reason it suddenly ceases to work. The first thing the perplexed and irate doctor does is to open the door of the case and attempt to start things moving by brisk rubbing with towels, catskin, or anything else that may be at hand. Unfortunately his zealous efforts in this direction will meet with failure, and after a few minutes, puzzled, perspiring, and vowing dire vengeance, he will be inwardly saying condemnatory things about the weather and audibly making terse

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and emphatic remarks (far other than complimentary) about the manufacturer of that machine in particular and the "Cussedness" of static machines in general. Next is an impatient telephone message to the office of the manufacturer about the failure of the machine to "charge."

The reason for the non-success of the method just described is as follows: The calcium or other dryer contained in the case had lowered the temperature inside below that of the outside atmosphere; as soon as the door of the case was opened, the vapor of the outside air immediately condensed upon the plates and the machine could not then be worked until it was thoroughly dried out. This condition of lowered temperature inside the case is also instrumental in bringing about a condensation of vapor upon the outside of the case, thus causing the current to be short circuited and the machine to be discharged. The importance, therefore, of keeping the machine dry and clean is at once apparent.

The shortness of the spark and the quick spitting easily reveals the fact that there is vapor in the case, the discharge being uneven, and the best method of remedying the difficulty is, as described above, by means of the jars containing cracked ice and salt.

When everything is dry inside the case the machine will work even though the humidity outside be 80, 90 or even 100°. The force, however, will of necessity be less, owing to the fact that the current is conducted off by the vapor.

Sometimes it becomes necessary to dry out the inside of a static machine, as when the plates become sticky and a gluey substance forms on the inside of the case and upon the insulators. Just what the nature of this substance is, I have not been able to determine, but I have noticed it frequently when I have used chloride of calcium without rebaking it. In order to dry out the case a Bunsen burner may be used. The flame having been lighted and the burner properly adjusted, it should be placed within the case, the door of which should be fastened at the top but sufficient space should be allowed at the bottom to provide for the admission of air into the case—otherwise the light will go out. The glass circles should now be kept revolving slowly as this keeps the air in circulation, and when everything gets hot inside (the straight plates, round plates and the case itself) both doors should be opened and the machine

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allowed to run until it is cool; the doors should then be closed and the process repeated. Should a Bunsen burner not be available, a good-sized kerosene lamp may be used, but *care must be taken that it does not smoke,* as the carbon from the smoke will settle on the parts of the machine, forming a good conductor. By watching the lamp any trouble of this kind may be avoided.

A case came under my observation in St. Paul, where a machine had been shipped by way of the lakes and become soaked with water. The revolving plates were opaque white and while the machine could be charged, only a spark of two or three inches long could be obtained. I was nonplussed for a time as to the cause of the trouble and how to remedy it. I took a large Bunsen burner, placed it in the case as previously described and allowed the machine to revolve. Very soon I noticed the disappearance of the opaque white in patches. I kept the machine in motion, alternately opening and closing the door, for about half or three quarters of an hour, after which I put in chloride of calcium and closed the door. After this treatment the machine gave a spark seventeen inches long. The trouble was no doubt the absorption of water in the lacquer on the revolving plates.

At all seasons of the year when the atmosphere is cool and comparatively free from humidity, it is at times advisable to take out both doors of the case and allow the circles to revolve slowly for half an hour or so; cold, fresh air circulating about the plates goes a good ways towards keeping a static machine in working order.

I feel confident that if those members of our profession who own static machines would be careful to see that their machines were cleaned properly and often, they would get more satisfactory results and save themselves much unnecessary trouble and annoyance.

No. 217 East Twenty-third Street,
New York City.

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SKIAGRAPHY OF THE CHEST ;*

Its Why and How.

By Henry Hulst, A. M., M. D.,
of Grand Rapids, Mich.

Soon after the meeting of this society in Chicago a year ago, I received a letter from the chairman of the executive committee, saying he had examined some of my momentary skiagraphs of the chest exhibited there, and inviting me to read a paper here to-day, telling all about them.

Choice of title was left to me, and thus I have the honor of readnig to you on Skiagraphy of the Chest; Its Why and How.

I. The raison d'être of Skiagraphy of the Chest.

Not to leave a single stone unturned is the part of the good diagnostician. Yet, as a result of training or of peculiarity of personal make up, it is a well-known fact that all-around skill in the use of the various methods of investigation is exceptional.

This fatal tendency to one-sided development, together with the comparative newness of Roentgenology in internal medicine, may serve to account for both the neglect and the too exclusive employment of the Roentgen rays in the examination of the chest.

To illustrate: Buttler (Diagnostics of Internal Medicine, p. 654), while admitting that "Medical fluoroscopy and skiagraphy have proved their usefulness in diseases of the chest," gives it no further attention, because "The very considerable expense of the necessary apparatus, the technical skill required in its management, and the personal training and experience which is requisite before trustworthy work can be done places X-ray diagnosis for the present in the hands of the expert."

But is it not true that all medical diagnosis is a matter of training and large experience, and has not all knowledge and endeavor come down to us through the hands of the expert?

Such, at least, is implied in the opinion of Musser, the author of another late text-book on medical diagnosis, although he devotes but a page or two to X-ray examination of the chest. Musser says: "The use of the large number of instruments that are essential, and the chemical and bacteriological examinations that are made require a great deal of time. Often

*Read at the Fourth Annual Meeting of the American Roentgen Ray Society, at Philadelphia, Penn., Dec. 10, 1903.

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the diagnosis is a question of hours or even of days. The patient profits thereby. The bedside labor is great, and, in addition, he must have a laboratory at his command for microscopical, chemical and bacteriological work. The outcome is that the scientific physician must have a clientele limited in number, or else have one or more assistants to aid him in his investigations. Without doubt the latter will soon occur." (Musser: Medical Diagnosis, p. 21.)

One thing seems certain: Mere considerations of expense and skill cannot prevent the general recognition and ultimate adoption of Roentgen ray examination in medicine if only "the patient profit thereby." And that he does profit thereby cannot be doubtful if he profits by advancement in diagosis.

"Die Roentgenologische Diagnostik der Erkrankungen der Brusteingeweide" of Holzknecht and "The Roentgen Rays in Medicine and Surgery of Williams," not to speak of other important contributions to the literature of medical diagnosis, have made it imperative for the phthisis-therapist as well as for the general internist to take cognizance of the light the Roentgen rays throw upon their subjects and have demonstrated the unwarranted dogmatism of Hildebrand's assertion that "In doubtful cases of phthisis pulmonalis we may safely spare ourselves the trouble of an X-ray examination."

Arriving at the question of the comparative usefulness of skiagraphy and diascopy, it cannot be denied that the latter admits of a wider application in the examination of the chest. Certain data, moreover, are more accessible to fluoroscopy than to skiagraphy. Thus, limited excursion of the diaphragm, which now goes in literature under the name of Williams' sign, is decidedly significant in the diagnosis of incipient phthisis and is best observed by the fluoroscope. Paralleloscopy is the only method for the exact determination of the size and shape of the heart, and the fluoroscope is needed for that. Hence, if the choice lay between the two methods I should prefer fluoroscopy. Indeed, a fluoroscopic view of the moving, palpitating contents of the chest constitutes at present the nearest possible ante-mortem approach to a post-mortem examination.

Why then skiagraph the chest at all?

The well-known fact that the photographic plate will show skin eruptions before they are otherwise visible, that therefore, it is more delicate than the eye, is utilized in skiagraphy

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as it is in dermatology and astronomy. Hence we no longer deem it sufficient to look at a fracture with the screen except for the purpose of general orientation and as a preliminary to a more adequate skiagraphic examination. My reason for skiagraphing the chest is no other, therefore, than that for skiagraphing anything else. That Williams "is able to detect an abnormal condition of the lungs in early tuberculosis better by means of the screen than by means of the photograph" (Williams, op. cit. p. 120), is not the fault of skiagraphy as such. For general orientation and analysis of the phenomena of motion fluoroscopy is of prime importance, but for bringing out structural detail skiagraphy is far superior, provided the object be at rest. Perhaps this provision was not appreciated as a condition sine qua non by some of the partisans of the flüoroscope. What in case of emergency skiagraphy may accomplish even for recording the phenomena of motion is well shown by the work of Eyckman of Scheveningen "Bewegungsphotographie mittels Roentgenstrahlen" (Fortschritte A. d. Geb. d. Roentgenstr).

By carefully observing this condition of rest, Holzknecht therefore finds, as we should naturally expect, that "A radiogram of the lungs and of the processes of consolidation is far superior to the image upon the screen (Holzknecht, op. cit. p.).

Hence its necessary superiority in the early diagnosis of tuberculosis of the lungs.

Unfortunately phthisis-therapists disagree on what constitutes an early diagnosis. Weicker is quoted in the Journal of Tuberculosis to the effect that "The early diagnosis implies the recognition of closed foci in the lungs, which furnish no bacilli bearing sputum." In the same journal Fraenkel says that "No diagnosis of any localization of tuberculosis is complete without the demonstration of the bacillus."

Nor do they agree much better on the means of making an early diagnosis.

Thus Brooks maintains that the "Tuberculin reaction is too promiscuously present in other diseases, uncertain, unacceptable and not entirely without danger," and that "It has been repeatedly shown that the glycerin and proteids of the culture are in themselves sufficient to produce the reaction" (Journal of Tuberculosis, Vol. iv., No. 3).

Tyndal relies upon the ear in auscultation for settling the

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diagnosis, and Brooks thinks that the thermometer is after all the best instrument in the diagnosis of early phthisis. (Journal of Tub. Ibid).

Weicker, Knopf, Tyndal, Brooks, Von Ruck and others may support Hildebrand in insisting that "Thus far the Roentgen rays have added nothing in certainty to the older methods"; but their own disagreement on what constitutes a certain early diagnosis as well as on the value of each other's methods deprives their opposition to the new method of meaning.

The objection that when a shadow is found the disease can no longer be considered in its incipiency is valid. But Roentgenology does not claim to diagnose tuberculosis of the lungs at its absolute incipiency; nor does any other method enable us as yet to do so.

It is by making the diagnosis of the prebacillary stage of tuberculosis of the lungs more certain that the new method adds to its earliness, whereas by aiming too much at earliness of diagnosis we may add to our record of percentage of cures (Goetsch cured 71 per cent, Trudeau 83 per cent, Journal of Tub., Vol. iv., No. 2), instead of rendering the diagnosis more certain.

It is easier to pile up a record on metamedical personal aptitude than on impersonal skiagraphs.

II. *Technique.*

1. Short exposure serves to eliminate to an appreciable extent the fogging due to vagrant rays.

2. By making the exposure while the expanded chest is entirely at rest we avoid the blurring of lung detail produced by the movements of respiration. Time exposure, on the other hand, necessitating respiration, defeats the very purpose of skiagraphy, the bringing out of detail the screen fails to show. To insist, therefore, on absolute immobility in the case of a hip and to utterly neglect this in case of a chest is strikingly inconsistent. Yet that has been the common practice in this country until quite recently. Thus an American manufacturer boasted only a year ago that his coils would take a chest in 30—40 seconds, which, he says, is 50 per cent quicker than any others of which he "has any knowledge."

Yet it is a fact that Mr. Isenthal exhibited instantaneous chests in London as much as three years ago (Archives of the Roentgen Ray, Vol. v., No. 3).

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At the previous meeting of this society last December, Dr. M. K. Kassabian of this city urged the advantage of short exposure and showed a good chest taken in 30 seconds on the installment plan. Upon the same occasion I exhibited my one second and one-half second chests, with and without intensifying screens.

Von Ziemssen and Rieder published their beautiful atlas, "Die Roentgographie in der inneren Medicin," the result of one second or shorter exposures, in 1901; their first results of instantaneous skiagraphy having been published in 1899.

I adopted the method fourteen months ago. Since then all of my chest work has been done in one second or less.

I use for the purpose an 18-inch Queen coil with a variable inductive resistance and a Wehnelt interrupter energized by the 110 volt direct Edison current.

My plates are ordinary X-ray plates of various manufacture, and I do the developing myself. The tube must be just right and is first carefully tested, not by a parallel spark gap, which is worse than useless, nor by using the hand for a test object, but by means of a Walter skiameter. For a medium sized and very large chest I use a Gundelach Wehnelt tube that will just show six holes in a Walter skiameter. For a small chest a Walter 5 tube is better.

For the sake of obtaining much contrast one or two tungstate of calcium intensifying screens may be used. The use of screens results, however, in the sacrifice of some detail.

SUMMARY AND CONCLUSION.

Skiagraphy of the chest is significant not merely as corroborating the results obtained by the older methods, but as a valuable supplementary method of physical diagnosis.

For the analysis of the phenomena of motion skiagraphy is less applicable than diascopy; but for obtaining pathological detail it is far superior and possesses the advantages of the graphic method.

The object to be skiagraphed should be as nearly at rest as possible; this is as true of the lung as it is of the hip. Momentary exposure (½-1 second) during suspended respiration is long enough. Flash exposure is possible, and we shall come to it in the future.

To skiagraph limited portions of the chest diaphragms should always be used. For this purpose I use my X-ray

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camera, a modification of Albers-Schönberg's Kompressionsblende.

To secure more contrast, though at the expense of some detail, the dry plate or film may be sandwiched between really fine-grained calcium tungstate screens.

A good induction coil is at present the only available instrument capable of furnishing the requisite electrical energy.

The tube must be able to keep its vacuum. A critical tube for a medium-size chest should give a skiametric reading of W. 6 or its equivalent.

The lowest tube that will do the work is the best for the purpose.

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Editorial.

HIGH FREQUENCY CURRENTS.

The differences between the various electric modalities are simply differences of degree, yet so widely do the many manifestations of electric energy differ in their effect, from physiologic to therapeutic, that we have been accustomed to speak of different kinds of electricity, galvanic, faradic, static, etc., therefore, although simply varying manifestations of electric power and equally obedient to the great law of Ohm, they are practically and for working purposes quite different in kind. In high frequency currents we have still other manifestations of electric force, and just as faradic currents distinctly differ in tension and therefore in effect, according to the construction and nature of the coil, so high frequency currents differ according to the nature of the initial force inducing them and the manner of their discharge. High frequency currents are obtained by a step-up process. The rapidity of the oscillations of the static wave current are sufficiently high to entitle it to be called a current of high frequency.

The hyper-static current, so-called, which is from a form of Tesla coil, greatly exceeds the former in the rapidity of its oscillations, just as the D'Arsonval current exceeds the hyperstatic. The remarkable and distinguishing characteristics of high frequency currents are that the higher we go in the step-up process, the less marked are the motor and sensory manifestations. It has been shown that beyond 500 excitations per second the phenomena of muscular contractions become less and less until none can be produced. And yet notwithstanding this absence of sensory effect the remarkable spectacle of a glowing incandescent lamp is presented, as the current passes through it, having previously passed unfelt through the human body. The physiological effects produced by this painless and apparently innocuous manifestation of electric force have been made the subject of much patient investigation and the general results arrived at are that besides a general modification of nutrition, there is a decided increase in arterial tension, a greater elimination of CO_2 and an increase in the production of heat.

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As concerns the therapeutic range of the two forms of high frequency apparatus now in more or less popular use, experience confirms what from the nature of the two, one would naturally infer: the apparatus generating a current of considerable magnitude but lower tension (D'Arsonval), influences metabolism and its effects are deep-seated and wide-spread; the apparatus generating a current of little, if any, magnitude but higher tension (hyperstatic), seems to exert little, if any, constitutional effects. These are mainly local, and its usefulness is especially seen in the various superficial but benign skin affections. But high frequency and high potential combined with appreciable magnitude are potent therapeutic factors, producing results that are distinctly constitutional and deserve the most careful investigation.

Miscellaneous Abstracts.

A CASE OF CARCINOMA TREATED WITH THE X-RAYS

By G. B. Batten, Archives of the Roentgen Ray, February, 1904.

The patient, a woman aged 56 years, had her left breast and axillary glands removed by Jonathan Hutchinson, Jr., in November, 1900, for what was demonstrated by microscopical examination to be "typical scirrhous" cancer. During the time intervening between that date and September, 1902, six recurrent nodules had successively appeared and had been excised by the same surgeon. Another nodule appeared in November, 1902, which was subjected to X-radiance, instead of the knife. The tube was of "medium hardness," anticathode located six inches from the patient's skin. Eight treatments of ten minutes duration each were given in fifteen days, and the pain began to diminish after the second application, disappearing entirely before the fifteen days were up. The applications were then suspended for thirteen days and three more of fifteen minutes duration each were given during the six succeeding days, when dermatitis appeared and they were suspended again. A month later two treatments of twelve and a half minutes each were administered.

Three months later the nodule and all signs of the disease had entirely disappeared and patient continued in good health

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until four months after, when she died from septicaemia caused by the bite of an insect. The portion of skin and underlying tissue where the recurrent nodule, which had disappeared under X-radiance, had been located, was excised and the microscopic findings by Dr. James Galloway are of such interest that they are appended in full, as follows:

"1. The epithelium is thin, but the different layers are recognizable with little difficulty.

"The stratum mucosum consists of two or three layers; the lowest layer is arranged in an irregularly 'palisade' order on the underlying cutis, but this arrangement is not nearly so perfect as that seen in the normal skin. The cells of the stratum mucosum seem to be of nearly normal type. There is an imperfect stratum granulosum; its cells are few in number and sparsely scattered over the underlying epithelium. Sometimes considerable distances separate the adjacent cells, as seen in section; but this layer seems to be sufficient from the functional point of view to permit of the formation of a complete stratum corneum. The cells of the stratum corneum are completely keratinized, and although the cells are more loosely arranged than in the normal skin, it forms a complete horny covering.

"The interpapillary processes of epithelium are practically non-existent, as the papillæ of the cutis have nearly disappeared.

"Remnants of the skin appendages are recognizable in places.

"2. The cutis consists of bands of connective tissue closely compacted, with comparatively few connective-tissue cell nuclei, so that the aspect of scar tissue is presented. The papillæ are nearly completely gone, the upper edge of the cutis being only slightly undulating; only here and there are anything like true papillæ to be observed. Foci of leucocytic infiltration may be seen usually towards the upper surface of the cutis, giving evidence of inflammatory reaction; but these are not numerous, and are of small size. No special widening of the vessels of the cutis is noticeable.

"No signs of malignant epithelial growth are noted throughout the extent of this section.

"The general appearance of this specimen is that of skin which has undergone atrophic change as the result of inflammation of low degree."

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COMMUNICATION REGARDING THE TREATMENT WITH LIGHT AFTER DREYER.

Prof. A. Neisser and Dr. Halberstaedter, Deutsche Medizin. Wochenschr. 18 Feb., 1904

In this paper Neisser, the well-known dermatologist and genito-urinary surgeon of the University of Breslau, takes up the study of light, thus giving a new impetus to further investigations in this field. He speaks first of the influence of light on the skin, giving a review of the present knowledge on this topic. He also includes the question of the bactericidal power of light ray, and in this connection mentions the fact that the penetrability of rays varies inversely as its bactericidal power; in other words the most actively bactericidal rays of the blue end of the spectrum possess only a very limited power of penetrating into the deeper parts of the body. For this reason Dreyer of Copenhagen conceived the happy idea of influencing artificially the tissues in such a manner that they become just as sensitive to the green, yellow and red rays as they normally are to the ultraviolet. In the same manner as a photographer's plate is made sensitive, so did Dreyer conceive that the body tissues might be influenced by using Erythrosin (1:4000.). The result with cultures proved his theory perfectly. By using a 26 ampere lamp he saw that bacteria on the insensitized plate were killed only in the ultraviolet region, while the other parts of the spectrum showed no influence of the light. On the "sensitized" plate the effect was seen not only in the violet, but also in the yellow-orange region, viz., destruction of bacteria. Experiments on frogs as well as on guinea pigs were also positive. From these facts we may therefore conclude that a therapeutic effect of light is obtainable also in deep-seated lesions of the body and according to Neisser it is not fluorescence.

Halberstaedter, Neisser's assistant, repeated Dreyer's experiments, using the method practically in twenty-five cases, viz., of lupus, scrofuloderma, tuberculous glands, spina ventosa, etc. He used 1 per cent to 1-10 per cent sol. Erythrosin in 0.85 salt water. The injections were made as deep as desired and from two to five hours later light was used for 15 to 20 minutes, or even longer if necrosis was expected as in carcinoma.

It is a great field that has been opened by these studies, and there is no doubt that we shall hear more within the next year or so.

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SKIAGRAPHIC ERRORS, THEIR CAUSES, DANGERS AND PREVENTIONS.

Lewis Gregory Cole, N. Y. Med. Jour. and Phila. Med. Jour., March 26, April 2 and 9 1904.

Examinations of fractures by the X-ray should be made with mathematical accuracy, and then any deformity that may exist, even to one-sixteenth of an inch can be shown. A skiagraph is a registration on a photographic plate of the rays that penetrate the parts exposed. The rays radiate from the anode and are absorbed by the different parts of the body in proportion to the amount of solids contained therein. The farther the solids are from the plate, the larger and more diffuse will be the shadow as registered on the plate.

The rays that strike the plate perpendicular to its plane are more powerful than those that strike it at an angle, and the greater the angle the less powerful the rays.

Many fractures near a joint are undetected and untreated unless revealed by the X-Ray. In many cases there are small fragments chipped off from the articular surfaces, and if the fracture is not discovered the fragments are not allowed to unite because the part is not kept at rest. Afterwards they set up a synovitis that is hard to treat. In fractures, the skiagraph is useful in doubtful cases in making a diagnosis, and also when it is desired to compare the position of the fragments with the normal bones.

The best skiagraph to show the fracture is usually the most unsatisfactory as far as assisting the surgeon in the proper adjustment of the fragments is concerned. In making skiagraphs for the purpose of comparing the abnormal with the normal, it is important that in both cases all of the pictures should be made with the tube, plate, and part in exactly the same relative positions.

The article is illustrated with a number of drawings showing the manner in which skiagraphic errors are made. In making a skiagraph the tube should be placed as near as possible and perpendicular to the fracture. It is often necessary to take two skiagraphs at different angles before a fracture can be detected if there is but slight separation.

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TWO CASES OF SPLENIO-MEDULLARY LEUKAEMIA; TREATMENT AND RECOVERY.

B. L. Bryant and H. H. Crane, Medical Record, April 9, 1904.

Both cases were severe, and the clinical notes upon the condition and progress, including the findings of blood examinations are full and convincing. Both were treated with arsenic and one of them with the X-Ray in addition to the arsenic, both recovering, the one treated by X-Rays in three months and the other in eight months. The case reported by Dr. Nicholas Senn in the Medical Record of Aug. 22, 1903, as cured by the X-Ray is referred to, and the article closes with the following comment: "It is unfortunate that in both Dr. Senn's and in our own cases arsenic was given as well as the Roentgen Ray. In Dr. Senn's case Fowler's solution was given for three weeks before the other treatment was begun. In our first case it was continued throughout the treatment. In the second case it was all the treatment the man had. It is a question as to how much good the ray did in this case. It seems to us that it hastened matters in the first case. The woman had been under treatment for a few days before there was any noticeable diminution in the size of the spleen, followed by a severe constitutional reaction; while the second patient improved slowly with no marked disturbance, but the tumor did not begin to disappear until three or four months after the beginning of treatment."

PATHOLOGICAL CHANGES IN TISSUES UNDER THE INFLUENCE OF THE X-RAY.

W. S. Newcomet, Medical Record, April 9, 1904.

From a microscopical study of a number of cases Newcomet concludes that "No single form of degeneration is alone characteristic to the X-Ray, and that the form of degeneration observed depends entirely upon the tissue exposed and the method of X-Ray application; second, it would seem that the effect of the X-Ray was upon the cell elements in the exposed parts, but why certain normal cells, such as those in hair follicles, etc., should be more susceptible than other tissue is still a question of doubt, but in lieu of the vascular disturbance

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found by many observers it might be thought that this cause plays an active part." He believes that individual idiosyncrasy as regards susceptibility to the action of the ray is a factor which must be reckoned with, and that the induction of a dermatitis is by no means necessary in order that the cure of a malignant process shall follow. He has not found that thickening of the blood vessels is a uniform result of X-radiation. The incubation period of a burn varies from a few hours to several months and the severity of the pain occurring either during this time or when the lesion has fully developed, is no index to the severity of the actual pathological changes present.

ON THE TREATMENT OF CANCER WITH RADIUM BROMIDE.

H. G. Plimmer, London Lancet, April 16, 1904.

Thirty millegrammes of radium (degree of radio-activity not stated) enclosed in a vulcanite capsule covered with talc, were used to treat 17 cases of carcinoma, in all of which the diagnosis had been microscopically confirmed. The radium was applied directly to the nodules, the only thing intervening between the radium and the skin being the talc top of the capsule, and the exposures ranged from 5 to 40 minutes each. A month after the exposures had been finished (number not stated) the cases were examined and results found to be absolutely negative in every case. Microscopical examination of exposed nodules after excision showed no modification of the cancer cells or fibrous tissue, but there did appear to be an increase in subcutaneous round-celled exudation, which is considered accounted for by the irritation of the skin set up by the radium. Plimmer found 10 minutes' exposure to the radium sufficient to blister, which was following by scabbing; under the scabs was a very slowly-healing ulcer. He considers it probable that "the emanations from radium can only act upon young and rapidly growing cells and that older cells, especially if surrounded by fibrous tissue, are less and less easily affected, and if there be an excess of fibrous tissue the cells are not at all affected."

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PRELIMINARY NOTES ON TRANSILLUMINATION OF THE STOMACH WITH FLUORESCEIN.

H. W. Lincoln, Med. Record, April 23, 1904

A little electric light, which is fixed in one end of a small capsule and connected to the battery by fine copper wires enclosed in rubber tubing about the diameter of a match, is used. It is employed as follows: Ten grains of quinine are given during the 12 or 24 hours preceding the examination, as this drug increases the translucency. The patient swallows the capsule after having fasted for five or six hours, and then drinks a glass of water in which has been dissolved 30 or 40 grains of sodium bicarbonate (acidity of solution lessens the illuminating power of the fluorescein). He then drinks another glass of water, in which have been placed 1/8 grain of fluorescein, 1 drachm of glycerin, and 20 or more grains of sodium bicarbonate. The room is then darkened, the electric light which is in the stomach turned on, and the outline of the stomach becomes visible. Its position and dimensions can then be determined with an ease and exactitude exhibited by no other method, even when the abdominal walls are unusually thick. Growths lying upon the anterior gastric wall, or anything lying between the stomach territory and the observer, will show as a dark spot, as happened in one case when a plugged transverse color stood out plainly.

MY EXPERIENCE WITH PHOTOTHERAPY; A PRELIMINARY REPORT.

Julius Rosenberg,—N. Y. Med. Jour. and Phila. Med. Jour., April 23, 1904.

Twenty cases exhibiting pain as a prominent or exclusive feature of the symptomatology, chiefly neuralgia and neuritis, both traumatic and idiopathic, are reported. The group of neuralgias numbered 9 cases, which were of various sorts and degrees of severity from simple intercostal to severe tic douloureux of 10 years' standing and included a case of traumatic coccydinia, which had existed one year; they were entirely cured with from 2 to 7 applications with the exception of one patient, who discontinued the treatment prematurely. Eight cases of neurities in various locations, including sciatica of several years' standing, were cured.

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THE TREATMENT OF HYPERTROPHIC PHARYNGITIS AND LARYNGITIS BY THE EMANATIONS FROM THORIUM NITRATE.

J. Gordon Sharp—London Lancet, April 23, 1904.

Sharp suspected tuberculosis in this case, which was a very severe one of long standing, and applied glacial acetic acid for six months with only slight improvement. Several months later the patient returned again for treatment, with the parts practically unchanged, and it was decided to try inhalations of the emanation from thorium nitrate. An all-glass inhaler holding 500 c. m. and fitted with special glass outfit caps was used. This was partly filled with water in which was dissolved 100 grams of neutral thorium nitrate; the patient was directed to inhale for one hour every day. At the end of six weeks the following results were apparent: The pharyngeal wall was covered with healthy secretion and the nodules, which had been looked upon as tuberculous, had almost all disappeared, the lingual tonsil, which had previously been much hypertrophied, was greatly diminished in size; the interarytenoid swelling had diminished so that the cords could be adducted throughout their entire length, and the venticular bands had so far returned to their normal state that the vocal cords were visible. Sharp does not feel justified in claiming these results for thorium nitrate, but thinks that they are sufficiently suggestive to encourage further trial of the method.

ACTINIC SUNLIGHT IN THE TREATMENT OF PULMONARY TUBERCULOSIS.

J. W. Kime, N. Y. Med. Jour. and Phila. Med. Jour., April 30, 1904.

It is the actinic and not the heat rays from the sun that are of therapeutic value, as Kime believes, from experiments which he has made with photographic plates exposed to sunlight, which had passed through glass of different colors. He reports a number of cases much benefitted in from 1 to 12 applications. All improved with the exception of one case of facial neuritis, and this case has been kept comparatively comfortable by giving an application every third day, whereas previously she had been in a condition of constant misery. Rosenberg uses the ultra-violet rays from a 55-ampere iron-carbon arc with mirrors arranged so that he can collect and concen-

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trate the rays as they diverge from the arc, according to desire. He believes that a lamp using a high amperage is essential for securing satisfactory results and that the exposures must be from 55 to 75 or 90 minutes. Although this length of exposure will produce some erythema on sensitive skins, yet with ordinary care it neither blisters or produces any other lasting injury. Pain, whatever its source, usually disappears under the influence of such treatments. He reports encouraging results in the pleuritic pains and bronchial irritations following influenza and believes "that the ultra-violet rays will be of much benefit in the early stages of pulmonary tuberculosis"; that the maximum quantity of chemical and the minimum quantity of heat rays may be obtained by passing the sunlight through blue glass, after which it may be focused as desired by means of a lens six inches in diameter. He subjects the patient to the treatment for an hour or more each day. He considers the results which he has obtained with such applications in lupus, chronic ulcers, parasitic and other skin diseases, to equal those obtainable by any other apparatus or method. In pulmonary tuberculosis two or three months' treatment almost invariably produces marked improvement and in some cases positive cures, the bacilli in the sputum being the last evidence of the disease to disappear. Patients sometimes discontinue treatment with a few bacilli still remaining, and on returning several months later no bacilli can be found. It is considered that the light acts as a tonic and tissue builder, and that the chemical changes effected in the blood, which passes many times through the illuminated area during each treatment, is a powerful factor in the production of its physiological action. Kime prefers sunlight to that from any other source.

A CASE OF HODGKIN'S DISEASE TREATED BY X-RAYS.

E. B. Finch, Med. Record, May 14, 1904.

The patient first complained of pain in left shoulder and arm, which increased in severity for six months, when a swelling appeared over the cartilage of the second rib on the left side, not tender to touch and no constitutional symptoms were evident. An indefinite mass was palpable at the sternal notch. Clinical, pathological and blood findings indicated Hodgkin's disease, some of the tumor having been removed surgically.

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The patient was thoroughly treated with iodides, arsenic and iron without result and was placed under X-Ray treatment July 23d, 1903. At this time patient presented every evidence of severe suffering. Over manubrium sterni and at the left was a soft protuberance three inches in diameter at base and projecting outward about half an inch, very tender, with a small discharging sinus at right end of operation scar; cervical, axillary, and inguinal lymphatics, and spleen were enlarged. During the treatment he was given three grains of quinine three times daily as recommended by Morton for the production of fluorescence in the tissues (see abstract in this journal for March, 1904, page 100), and tonic doses of iron, arsenic and strychnia. A very high tube was used, the sittings lasting from forty to ninety minutes, the tube being moved at intervals of ten minutes, so that the whole body except the scalp and face was exposed to the rays during each treatment. They were repeated nearly every day for two weeks. At the eighth exposure the glands were noticeably smaller and at the fifteenth the cervical enlargement had disappeared, as had also the pain, which did not recur. At the 29th exposure on August 28th, the pre-sternal tumor had entirely disappeared and the sinus was completely heated. At the 62nd exposure on December 5th, the patient appeared to be entirely well and weighed 150¾ pounds, a gain of 14 pounds since commencing the treatment. The pre-sternal tumor recurred in March, and from March 12th to April 2, 1904, he was given twenty-one X-Ray exposures, flourescein being used internally in addition to quinine, with resulting entire disappearance of tumor. Finch believes that in time the disease will be entirely eradicated and that the quinine was a very helpful factor in producing the curative result.

THE VALUE OF RADIUM AND RADIUM RAYS IN MEDICINE.

By Dr. W. Caspari, Privatdocent en Academy for Agriculture in Berlin. Zeitschrift für diätetische und Physikalische Therapie, April, 1904.

Caspari gives an exhaustive resume of everything pertaining to radium and its use and value as a therapeutic agent.

Three different kinds of radium rays are distinguished, the alpha, beta and gamma rays. The alpha rays possess little penetrating power and are absorbed by a stratum of air of

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about 7 c. m. (less than 3 in.). The beta rays are of a very complicated composition and have a very different range of penetration, while the presence of the gamma rays can be shown at a distance of 2 to 3 c. m. (6 to 10 ft.) from the source of radiation.

The two properties of these rays which are of interest to the physician are their bactericidal and their tissue-destroying properties. These rays inhibit the growth of the bacillus prodigiosus, but only when the distance between the radioactive substance and the inoculated plate did not exceed 6 c. m. (2½ inches); after a longer exposure they kill the bacteria. Even the resistant spores of the anthrax bacillus succumbed after an exposure of 74 hours.

The human skin exposed to a radioactive preparation shows reddening and blisters following by ulceration in case of a long exposure. The time between the exposure and the pathologic effect fluctuates between a few hours and 30 days according to the different preparations employed.

Besides the skin, other tissues are affected by these rays; especially are pathologic neoplasms susceptible to their action. The radioactive substances can be introduced into the tissues and the diseased part directly made the center of their radiation. Thus, the main drawback of the light and Roentgen therapy is avoided, viz., that the effective rays are absorbed by the deeper layers of the skin and do not reach the seat of the disease. It is the property of radioactive salts that they, just as well as a non-radioactive salt, dissolve and without any detriment to their activity can undergo chemical changes, as precipitating, heating, etc. The lost radioactivity spontaneously reappears when the substances are kept in a closed room, so that ashes containing radium have entirely regained their original radioactivity in two months at the latest after a prolonged heating. A dissolved radioactive substance will either at once or in a short time have the entire radioactivity of the original material, and we will be able, for instance in anthrax, to inject the radioactive solution hypodermatically into the blood circulation of the patient (but this is only possible, since the radium has been separated from the soluble barium salts which are dangerous heart poisons). In a localized disease, the radioactive substance can be injected into the diseased area as an insoluble and therefore harmless barium sulphate. In this

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way, experiments have been made in cases of local diphtheria, anthrax, glandular tuberculosis, the results thus far, although showing no decided effect, encouraging further experiments.

Skin diseases have been treated by radium rays (lupus, psoriasis, hypertrichosis, alopecia), but it is questionable whether they are superior or equal to the Finsen or Roentgen treatment. In parasitic skin diseases with radium rays the efficacy of the radium rays is generally admitted, no matter whether the cure is due to the tissue inflammation caused by the rays or the bactericidal effect of the Becquerel rays.

Also malignant tumors have been treated by radium rays, principally skin carcinomata and sarcomata. Holgknecht, MacIntyre and Davidson report good results in ulcus rodens; Exner, an extraordinary improvement of a recurring melanosarcoma of the upper arm and an excellent result in a carcinoma of the buccal mucous membrane.

In the cancer ward of v. Leyden (Berlin) a large carcinomatous mammae has been treated by the subscutaneous method. It has been shown that even extraordinarily large tumors can be made to disappear by the radioactive substances. But it cannot be asserted to-day, if a permanent cure is possible and if metastases can be prevented. The danger of destruction of the healthy tissues does not seem to be so great as would be a priori assumed.

According to Danysz, the susceptibility of the different tissues to radioactive substances differs, and it is the skin which is especially susceptible.

The radiating energy of radium is shown in three different ways: 1st, in its effect upon a photographic plate; 2d, in its fluorescence; 3d, in its power to dissociate substances to decompose them into smallest electrically charged particles, i. e., into ions.

The radioactive substances also cause ionization of the air and experiments seem to show that the healthfulness of the higher altitude frequently depends upon the radioactivity of the air.

Radium has for a long time, perhaps without our knowledge, been playing a role in medicine. The fangs of animals, for instance, have radioactive qualities and are rich in radium itself (but compared to pitchblends only 1:1180).

Water can also become radioactive. Numerous springs con-

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tain radioactive emanation, but seem to lose their radioactivity when taken away from the source of their origin. This would explain one of the enigmatical experiences in medicine, i. e., that the favorable effect of mineral waters mainly depends upon their being drunk fresh at the place of their origin.

CATHODE RAYS AS THERAPEUTIC COMPETITORS OF ROENTGEN AND RADIUM RAYS.

By Dr. H. Strebel, Deutsche Med. Wochenschrift, 1904, No. 15, April 7.

Lenard has shown that cathode rays through an aluminum window can be brought outside the tube. The cathode rays have a similarity to the radium rays. They easily penetrate thin pieces of wood, paper, horn, metal; are totally absorbed by glass and quartz; cause phosphorescence; have chemical action (photograms through intransparent media); generate ozone; discharge positively and negatively charged surfaces; produce Roentgen rays in free air; ionize the air; are deflected by a magnet and behave in gases as light does in cloudy liquid.

The cathode rays have bactericidal properties; the micrococcus prodigiosus, and pyocyaneus were killed after a radiation of from 30 to 35 minutes.

The author exposed his arm to the cathode rays for 30 minutes. About 10 hours later a light reddening appeared a little larger than the window of the cathode tube. The reddening increased within the next two weeks to an inflammation. Then a small white spot appeared in the middle. After four weeks reddening still present, in the middle the skin pealed off. Gradually the red color passed into a light brown. The skin still peals off and has not returned ad integrum, but it can be seen that the scar will not be as ugly as those which appear after strong radium exposures.

The author is confident that the cathode rays will be useful in the treatment of carcinoma and other malignant tumors. The cathode rays can be made so small that they can be easily introduced into rectum, vagina, mouth and nasal cavity.

A CURE OF AN EPITHELIOMA BY THE X-RAY.—

W. L. Brosius, Am. Jour. of Surgery and Gynaecology, March, 1904.

The patient was a man of seventy-five years of age and in excellent health who had had a "lump" on the right side of his lower lip for a long time. Five months before he came under treatment the tumor began to ulcerate and when

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he consulted Dr. Brosius the area of ulceration, as indicated by photograph, was about the size of a silver quarter of a dollar. The patient suffered much pain and was obliged to take morphine in order to sleep. Diagnosis of epithelioma was confirmed by Dr. Emory Lanphear of St. Louis, who considered the case too far advanced for removal by knife or cautery. From May 21, 1903, to July 20, 1903, twenty-seven exposures were made with complete disappearance of all evidence of the disease as a result. After the third treatment the pain disappeared and sleep was secured without the aid of morphine. Dr. Brosius mentions several other cases in which he has secured equally satisfactory results with from fifteen to twenty exposures distributed over a period of from thirty-five to forty-five days.

ACCURACY IN X-RAY DIAGNOSIS.

R. H. Boggs, N. Y. Med. Jour. & Phila. Med. Jour. April 30, 1904.

The field of usefulness of the X-ray is becoming broader day by day, and still further advancement awaits us. Many radiographers in the past have made very little study of technic and apparatus, but in the future the surgeons will want their work to reach a certain standard, and therefore it will be necessary for every operator to work with a great deal of accuracy. There is much more careful and accurate work in radiography than most physicians realize. A large number seem to think that all that is necessary is to place the tube and plate and turn on the switch. Radiography is a specialty that requires a thorough knowledge of the apparatus and the physics that govern each part.

The most efficient tube is the one which is focused to a point, shows the bones dark on the screen and will only back up a very small parallel spark when excited by the proper apparatus. It can be easily understood that in a tube in which there is low internal resistance there will be very little current used up in resistance in comparison with one which backs up a long parallel spark gap between the terminals, this being explained by Ohm's law. With an efficient apparatus and good tube, and by using sufficient spark gap in series with the tube, comparatively short exposures can be made. The spark gap acts in two ways, that is, if sufficient spark gap is used it cuts

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out nearly all the inverse discharge, and, second, it acts as a condenser.

The following exposures for a patient weighing 140 to 150 pounds are sufficient: Chest, one to five seconds; gall stones, thirty; kidney stones, thirty; hip joint, fifteen to thirty, and knee and ankle, five seconds.

The shorter exposures produce more detail in the soft parts. If the exposure exceeds a second there is always a certain amount of involuntary movement; this affects the sharpness of the image on the plate in the case of soft tissue, but very little if any with bony structures.

Before a physician can make a diagnosis he must be familiar with a normal radiogram of every part of the body at different ages, and with the shadows cast by the normal parts in different positions. Everyone doing radiographic work should be familiar with what constitutes a normal radiograph, and unless the plate has reached this standard no diagnosis should be made. This cannot be emphasized too strongly, as frequently some one diagnoses a normal shadow as a lesion. In the past, cases have been operated on unnecessarily, because of faulty technique in making the plate, or failure to correctly interpret the plate after it has been properly made. The interpretation requires careful study by a proper light.

Current Electrology and Radiology

(Only articles relating to the above-named subjects will be abstracted.)

ARCHIVES OF THE ROENTGEN RAY.

London, Eng., April, 1904.

1. Lectures to Medical Practitioners on Physics applied to Medicine—By Sir Oliver Lodge, F. R. S. Lecture II.—Details Concerning X-Rays.
2. Artificial Fluorescense of Living Tissue in Relation to Disease—William James Morton.
3. The Production of Photographic Reversal under the Combined Action of Various Radiations.—C. E. S. Phillips.

1. This lecture deals with the X-Rays as used for anatomical and surgical purposes and the practical details pertaining thereto. The cathode rays, which are the foundation of the subject, are flying electrical particles called electrons, which are not particles of matter, but are the particles of which matter is composed. They may be called atoms of electricity, and

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electricity is now known to be really an atomic thing in the sense of having indivisible atoms. The motion of these electrons constitutes all electric currents. When they are intercepted they give rise to radiation, and it is the impact of the particles constituting the cathode stream against the anticathode which gives rise to the X-Rays. The cathode rays are identical with the Beta rays which constitute one of the varieties of radiation from radium. The X-Rays are not matter at all, merely waves or solitary pulses in the ether, and they travel in absolutely straight lines, not being refractable or deflectable by any substance. The sharpness of the image produced by the X-Rays depends upon the accuracy with which the cathode stream is focused upon one point. If the shadows are blurred it is because the rays proceed from more than one point. The significance of the present construction of X-Ray tubes and the phenomema produced by the passage of a current during the process of exhaustion are described as well as the modus operandi of X-Ray production. The vacuum of the tube tends to rise with use because some of the electrons composing the cathode stream escape through the glass. An electroscope held near the bulb will give effects demonstrating such escape. The lowering of the vacuum of the Crook's tube by heating the bulb is due to a trace of condensed gas being driven off from the glass. The various methods of regulating the vacuum are discussed and explained at some length as well as the different kind of current interruptors.

The most powerful mode of excitation is by a very high voltage (40,000) continuous current. With this, less than ten milliamperes will excite the bulb very well. Lodge states that at a pressure of two million volts air becomes a conductor, and for this reason flashes of lightning may be of any length, several miles easily. He says in reference to excitation: "A static machine gives an exceedingly weak current, but its continuous character makes it optically and photographically effective, and it does not strain the tube. It is believed also to be less liable to cause burns and damage—probably because all violence is avoided, and a continuous steady effect obtained, whereas the coil method gives a succession of very bright but very momentary flashes. It is probable that practitioners in the country would find a static machine, driven, say, by a wa-

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ter motor, the best method of obtaining electric power for ray treatment generally."

2. See abstract in this journal, issue of March, 1904.

3. Phillips sets forth very interestingly and at considerable length what is at present known of the phenomenon of photographic reversal. He appears to believe that the phenomenon is due to an increase in the oxidation of the photo-sensitive salts. The X-Rays do not cause reversal, but the radiations from radium do. It is suggested that the variations in the capacities of different forms of light to induce this phenomenon may in the future prove to be of value in differentiating and studying the different kinds of rays.

JOURNAL OF ADVANCED THERAPEUTICS.

New York, N. Y., May, 1904.

1. The Use of the Continuous Current in the Treatment of Cancer and Kindred Diseases.—William Winslow Eaton.
2. A Clinical Report on the Use of the X-Ray in Lesions of the Spinal Cord.—John W. Daniel.
3. Roentgen Ray in the Treatment and Cure of Cancer, Lupus, Rodent Ulcers and Eczema, with Histories of Cases Treated.—Elijah Wilkinson Smith.
4. Report of the Committee on Current Classification and Nomenclature of the American Electro-Therapeutic Association.
5. The Successful Treatment of Eighteen Cases of Granular Lids by the X-Ray and High Frequency Vacum Electrodues.—Albert C. Geyser.
6. Inaccurate Chemical Expression as an Impediment to Freer Use of American Mineral Waters.—George Thomas Palmer.

1. Imperfect vital statistics indicate that more than 50,000 persons die of cancer yearly in the United States. There is no known prophylaxis for it. All classes and ages are attacked alike.

Its increasing fatality and the unsatisfactory results of surgical operations are generally acknowledged. The British Medical Journal states that the death rate from cancer has doubled in the last twenty-five years. In Germany less than twenty-five per cent of cases are operable and of these less than one-tenth are saved. Philadelphia hospitals report only five per cent of cases of cancer of cervix uteri as cured by operation. Johns Hopkins Hospital reports like results. Professor Freund reports only two permanent cures by the knife in twenty-three years. Dr. Roswell Park estimates that in six years more the death rate from cancer will exceed that of consumption, small pox and typhoid fever combined.

The inhibitory action of the Finsen Light and Roentgen

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Rays is generally admitted in cases of lupus and superficial cancers. In deep seated maligant growths it is still on trial. Removal of all diseased cells by liquid air, electro- or thermo-cautery, arsenic or zinc paste, or mercuric cataphoresis is recommended.

For patients who refuse operation there still remains the continuous electrical current. This is generally beneficial, never harmful, and should be used in conjunction with X-Rays. He reports in detail eight cases. Five of these are living, one at one year, one at four years, one at six years and two at seven years after suspension of treatment. One died from metasasis of original disease, after six years of comparatively good health. Two died of other diseases after an improved condition of health of one and a half and the other of two and one-half years. These cases were treated by a combination of X-Ray (ten minutes) treatments and the use of the continuous current at a strength of from forty to one hundred and fifty milliamperes. The action electrode is made negative unless it is desired to control hemorrhage. Potters' clay is preferred as material for the electrodes when the heavier currents are used, as burns are liable to be produced with other materials.

2. Daniel reports two cases of locomotor ataxia of seven and ten years standing respectively, which he has treated with the X-Ray, making the applications by commencing the exposure at the cervical region of the spinal column and gradually lowering the tube until the whole spine had been subjected to the rays. The whole time exposure was ten minutes. In each case the patient perspired profusely at the time of the first application and there was a slight increase in the frequency of the pulse. After twenty exposures ability to use the legs was greatly increased. After some months of treatment control of the sphincters returned, the patients could walk without any assistance and returned to their ordinary occupations. Increase in weight and improvement in the appetite was noticeable early in the treatment. Patellar reflexes had not reappeared however, and the characteristic modification of the pupils still persists. Both patients were incapacitated for the performance of their daily duties when coming under treatment.

In three cases of enuresis in children in which the applications were made to the spine as in the cases of locomotor

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ataxia complete return of control of the sphincters resulted. The time required to produce this result, however, is not stated.

One case of spastic spinal paralysis of two years' standing, patient entirely bed ridden, was discharged as cured after four months' treatment, and resumed his occupation as pedlar. Six months later there was no evidence of a return of the trouble.

In two cases of herpes zoster with very severe pain and large rapidly spreading vesicles, two treatments over the affected spinal area gave relief of pain, and one week sufficed to secure entire disappearance of the disease.

Daniel believes that these results justify a further investigation of the effects of the X-Rays upon degenerative lesions of the cord in the hope of arresting further progress and of restoring some of the impaired functions.

3. Smith reports seven cases of malignant disease which he has cured by X-Ray applications, the durations of the applications being ten minutes, but the technical details of the distance of the skin from the tube and exciting apparatus were not given. The cases were as follows: One round celled sarcoma of the cheek, one round celled sarcoma of the neck, one primary epithelioma of the cheek, one recurrent epithelioma of the cheek and shin, one epithelioma of the nose, two carcinomas of the breast, two cases of lupus vulgaris which were cured in three months and thirteen weeks respectively, technique being presumably the same as applied to the malignant cases, and one rodent ulcer which disappeared with three months' treatment.

He has also treated many cases of eczema which have resisted all other methods of treatment with most gratifying results. He applies the rays for ten minutes twice a week. It is to be regretted that details of the technique employed are not recorded.

4. This report was presented at the annual meeting of the American Electro-Therapeutic Association, September, 1903, and cannot well be abstracted. Copies may be had from Mr. W. J. Jenks, 120 Broadway, New York, N. Y., chairman of the committee.

5. Geyser has successfully treated eighteen cases of granular lids by the use of the X-Ray and the high-frequency electrical current. The aim of treatment should be first, to check the development of the hypertrophy of the conjunctiva and no

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agent is better calculated to produce this effect than the X-Ray, and second, to bring about absorption of the granulations, and the high-frequency electrical current is well calculated to accomplish this object. In applying the treatment he first anoints the margin of the closed lids with vaseline and then everts the affected eye-lid keeping it everted by strips of adhesive plaster. The X-Ray is applied to the affected tissue every other day for two weeks through a circular perforation the size of a twenty-five-cent piece in a shield of rubber composition. This is followed by the high-frequency application, two or three times a week, the lids being prepared in the same manner as for the X-Ray application and the high-frequency electrode being brought into direct contact with the entire conjunctiva for from one to three minutes. The lids are then closed and a similar application with a broad, flat vacuum tube is applied to the closed lid on its outer surface. From three weeks to three months appears to be about the time required for complete disappearance of the disease.

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE.

Paris, France. March, 1904.

1. **Costal Tuberculosis Treated by the High Frequency Discharge.**—M. Billinkin.
2. **Contribution to the Study of the Effect of Electrical Treatments upon Basedow's Disease.**—Wm. Laquerriere et Morel.
3. **On the Relation of the Voluntary Contractions of Muscles to those Produced by Electro-Tonic Methods.**—Denis Courtade.

1. M. Billinkin has treated two cases of costal tuberculosis, by means of the high-frequency discharge, with excellent results.

The discharge was administered every other day for fifteen minutes by means of a glass vacuum electrode. The abscesses healed quickly and the constitutional effects disappeared in a short time. A case of Pott's disease which has been under treatment a short time is improved.

2. Mm. Laquerrier and Morel have successfully treated a case of Exophthalmic goitre by the glavanic combined with the faradic currents. The case which was of some severity was treated thrice weekly. After the nineteenth treatment the condition has so far improved that the patient has been discharged as cured. The cathode was applied to the thyroid body and the anode to the nuchae. The intensity of the current was 25-30 ma. and the time 10-12 minutes.

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3. There exists a great difference in the nature of the contractions of muscles produced by means of electric currents and voluntary effort. There are two cases to consider; the one where the lesion has reached the superior centers, in which case there is from the beginning absence of muscular volition, as in haemiplegia or descending degeneration; the other where the lesion has reached a point anywhere in the motor neuron. In the latter case there is loss of voluntary contractility with the reaction of degeneration, or there may be retention of the voluntary contractility with abnormal reactions to electrical stimulation, as is frequently seen in plumbism. If one side only is affected the muscles of the other side may show an abnormal response to the stimulation of the current while the voluntary function remains practically unimpaired.

The presence at the same time of abnormal reactions and normal volition is often met with during the period of reconstruction after a lesion of the motor neuron, and may be accompanied by abnormal conductivity and sensibility.

JOURNAL DE PHYSIOTHERAPIE.

Paris, France. April, 1904.

1. **The N Rays.—M. M. Lambert.**
2. **The Therapeutic Use of Hot Sulphur Baths.—Dr. Senac-Lagrange.**

1. The discovery of the N-Rays is of considerable interest from the point of view of the consideration of the distribution of energy in the inorganic as related to the organic world.

Blondelot to whom is due the credit of the discovery had for a long time been aware of the existence of a disturbing element in the focus tube. During an experimental endeavor to polarize the X-Ray he noted an asymmetry in the relative actions of the X and cathode rays which could best be accounted for by the supposition of the presence of a third ray. Subsequent experiment proved this supposition to be correct and that this ray was susceptible of reflection, refraction and also circular and elliptical polarization in very much the same manner as light.

These rays when focussed upon a small recurrent spark from a condenser, caused an increase in the brilliancy and in the force of the explosion. They are incapable of producing either fluorescence or photographic action but are possessed of an ability to traverse divers substances opaque to luminous rays, equalled only by the X-Ray.

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The sources of the N-Rays now known are iron and steel at all times, the mantle of the Welsbach lamp, sulphur, metals that have been heated a dull red, and under certain circumstances, the human body. The sun is also a prolific source of these radiations.

The effects of the N-Ray were attributed to heat rays, but the experiments of Charpentier and D'Arsonval have amply disproved this. Among the points of difference may be mentioned that the heat rays will give a deviation of the galvannometer when connected with a thermopile while the N-Rays have no noticeable effect, and that the effect of heat in altering the resistance of wires is apparently altogether absent in the case of the N-Rays.

The position of these rays in the spectrum is determined at the present time, with considerable certainty to be in that region lying between the longest heat rays and the shortest electro-magnetic waves.

Up to the present time there have been a great many experiments undertaken to substantiate the identity of these radiations and it may be safely assumed that they are an independent entity.

Society Meetings.

Minutes of the March Meeting of the Chicago Electro-Medical Society.

The meeting was called to order by the president, Dr. Burdick.

The minutes of the preceding meeting read and approved.

It was moved and carried that a resolution commemorating the work of Dr. Marsh be printed in the report of the society.

Dr. Burdick then gave his paper on the "Physics of the Static Machine."

The paper was discussed by Dr. Neiswanger and Mr. Treadwell.

The society then adjourned.

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Minutes of the April Meeting of the Chicago Electro-Medical Society.

The society was called to order by the president, Dr. Burdick.

In the absence of the secretary, Mrs. M. E. Gardner was appointed secretary of the meeting.

There being no business to transact, a paper was read by Dr. John T. Lave on "High-Frequency Currents."

The paper was illustrated by the Double Resonator and the Condensation Couch.

The paper was discussed by Drs. Neiswanger, Coleman and Burdick.

The society then adjourned.

A BARGAIN

One 12-inch Scheidel Coil and Rheostat in perfect condition, for sale. Address H. in care of the journal.

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Archives of Electrology and Radiology

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Original Contributions.

A FEW X-RAY EXPERIENCES.

By Charles H. Fessenden, M. D.,
of Newton Centre, Mass.
Attending Physician and Electro-Therapeutist to the Newton Hospital. Etc.

My first venture into the field of X-ray therapy was made some three years ago, and it was perhaps the most valuable as well as peculiar bit of experience that could have come to me just at that time. I learned in a most emphatic manner two things—first, that I was dealing with an agent extremely potent, and second, that the factor of idiosyncrasy must be carefully determined. The results in this case were all the more startling from the fact that the apparatus used was one of comparatively small power, being a static machine having but four plates, eighteen inches in diameter, with a correspondingly diminutive tube. The case was one in which there had been an amputation of the right breast for cancer, with removal of axillary glands. The cicatrix was red and painful with some spots of induration, the arm was stiff, swollen and powerless, with limited motion. A twenty-minute treatment was given with a medium tube with the anode one foot distant from the patient's skin, and the patient came for her second treatment two days later with no other signs than some lessening of pain. The same method was employed this time, but with decidedly different results, for in about twenty-four hours there appeared a general erythema over the entire chest and extending around upon the back which was accompanied by a high temperature and profound general disturbance, the attack as reported to me by the attending physician, closely resembling one of erysipelas. This condition lasted about ten days and was followed by signs

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of decided all-round improvement, but before she was in condition to return for treatment she was thrown from a carriage, fracturing wrist, ankle and ribs, and from this injury she never recovered.

The subsequent cases have all been treated with a tube excited by a Waite and Bartlett ten-plate machine.

Case II. This patient was referred to me in November, 1902, with the following conditions: About six months previously the right breast had been amputated and the axillary glands removed; the resulting cicatrix was red and painful, the arm swollen and of so little use that it was carried constantly in a sling. There was slight induration about the scar, but no marked signs of recurrence. Her temperament was of the extreme neurotic type and treatment was undertaken for the relief of pain, which was so intense that she was unable to lie down, spending her nights propped up in bed with a number of pillows, obtaining sleep only by frequent applications to the breast of cloths saturated with water as hot as could be borne. She was given a fifteen minute treatment with a high tube, anode one foot distant from the skin; this was followed in a few hours by an aggravation of pain which continued through that night, but which was followed the next day by a decided increase of comfort and the second night was comparatively restful. Treatments were given with a high tube, anode one foot distant from the skin every third day, all of which were followed by a greater or less degree of aggravation, to be followed in turn by increased relief. The superfluous pillows were one by one discarded, the hot water abandoned, and her nights were passed in comfort. All irritation disappeared from the cicatrix and the arm was less swollen and much more useful. Improvement continued up to January of this year (1903), when she suffered from an aggravated attack of influenza, and in February she died suddenly, apparently from heart failure.

While no particularly brilliant results can be claimed in either of these two cases, the treatment in both was followed by such marked results that it is reasonable to infer that, barring the untoward happenings, the ultimate results would have been very satisfactory.

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Case III. This case was also one of amputation of the right breast six months previously, with removal of the axillary glands. This patient was also neurotic though in a much less marked degree than the preceding one. The cicatrix was red and painful with a tendency to erosion at its central portion; there was more or less induration and the arm was swollen, painful and with limited motion. Treatments were given three times a week with a high tube, the anode one foot distant from the skin, from August 9 to September 21, eighteen in all. At the latter date she left for her home in New Jersey, free from pain, scar white and soft with no tendency to erosion, surrounding induration gone, arm less swollen and stiff and able to be used in sewing without discomfort, a thing that previous to treatment had been impossible. She left with the understanding that should any unfavorable signs recur she would report to me that I might refer her to some one in New York for subsequent treatment, but as no report has been made it is fair to take it for granted that relief has proved permanent.

Case IV. Some three months previous to his coming to me this patient, a middle-aged man, noticed a small indurated spot in the scrotum, which finally broke down, to be followed by other similar spots in the immediate vicinity, which also broke down, uniting with former lesions to form an ulcer, which, when I first saw it, was two inches in diameter, painful and discharging rather freely. It had an indurated edge and there were other spots of induration, evident foci for more extensive destruction of tissue. This condition utterly failed to yield to the most careful antiseptic treatment, and at the suggestion of a consultant, who had observed the results of extensive work done at the Boston City Hospital, the X-ray treatment was decided upon as the most probable source of relief. Treatments were given three times a week, with a high tube, the anode at one foot distance. From the first treatment there was relief of pain, the discharge lessened, the edge became less indurated and cleaner cut, still there was some additional invasion of tissue, and the whole sore was somewhat deeper. This was the condition at the end of the tenth treatment, when, as the family were Homoepathic in belief, a prominent surgeon of

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that school was called, who advised immediate excision with removal of the right testicle. To this the patient would not consent, but preferred to continue the raying for a while longer at least. At this time I began to use the brush discharge from a wooden electrode for five minutes following each raying. From this point the improvement was rapid and satisfactory, granulations began to appear, the discharge, together with invasion of new territory, ceased, and the ulcer appeared to be granulating from the bottom. At the end of the eighteenth treatment a new consultant was called, who, for some reason deemed the X-ray a superfluity, so it was discontinued from that time, but the mischief had been already done, and healing was completed in a few weeks, leaving, as the attending physician reported, a scar that was as smooth and clean as though it had resulted from careful excision, and with no sign of induration. This case brought forcibly to my mind the value of the brush discharge as a promoter of granulation, and I have made frequent use of it since, employing it as I did in this case as a supplementary rather than an alternate measure.

Case V. This patient, a woman, was suffering from an aggravated attack of psoriasis, which had been present for more than a month and which involved the entire trunk, both chest and back, together with the posterior aspect of the thighs down to the knees. The itching was intense and she had scarcely slept for the five nights preceding.

At the first treatment I made a ten-minute exposure of the entire chest and back with a high tube, the anode at eighteen inches from the body, that as much surface might be covered as possible. At her second visit, which was the third day following, she reported that following the first treatment there was relief from the irritation and that she had a comfortable night's rest. Following the third treatment there was profuse desquammation, cessation of all irritation, and no new invasion. Five treatments in all were given with entire relief as a result, and at the end of six weeks more she reported to me that there had been no return of her disturbance. Two other cases of psoriasis of a much less marked degree yielded to three and five treatments respectively.

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Case VI. This case was that of a middle-aged man with a lupus patch at the corner of the mouth about the size of half a dollar. It made its appearance twenty or more years ago, and although it had been treated for a good part of that time by caustic and other measures, had gradually increased to its present proportions.

When he first came under my care it was covered with a thick brown scab, moist and somewhat tender. Two treatments were given with an interval of two days between, using a high tube for fifteen minutes, with the anode at one foot from patient's skin. The second application was followed by such a decided irritation that treatment was discontinued for two weeks. When he returned all irritation had gone and the scab was dry, hard, and inclined to separate at the edge. Thirteen treatments were given, before the last of which the scab had entirely disappeared, leaving a smooth scar, which since then has gradually bleached, leaving very slight disfigurement. At the end of three months, there being a slight roughness at the margin, treatments were resumed at intervals of one or two weeks as a matter of prophylaxis.

Case VII. A sarcoma located on the lobe of the right ear. The patient, a young lady, had been twice operated on, but it had recurred each time. There was more or less tenderness, some induration and a constant oozing, forming a moist scab. Five treatments were given with a high tube, the anode at one foot, the result being that all tenderness disappeared, the induration was removed and the scab became dry. At this time she went to Canada for the holidays and I lost sight of the case, till the early spring, when she reported that after her return home the improvement still continued, but in July of this year there still being some slight tenderness, treatments were resumed and twelve more given up to September, at which time the case was discharged with no other sign than the loss of tissue from earlier operations, with a very slight scar.

Case VIII. This patient, a man of middle age, suffered from an epithelioma on the right cheek, just over the zygoma. It had been twice apparently cured, once by internal medication and once by a paste treatment, but had recurred each time.

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When I first saw him the sore was about three-quarters of an inch in diameter, consisting of a central depression surrounded by a ring of nodules, several of which were covered with moist yellow scabs, there was more or less induration about the sore, but no particular tenderness. Five treatments with a high tube, anode one foot from face, were given on alternate days with little other apparent result than a drying of the scabs.

Before his next appointment I learned from his physician that he was desperately sick with some intestinal disturbance, which at first was feared to be appendicitis. His condition, while not of this nature, was so serious that a consulting surgeon was called, and the patient was given to understand, whether directly or by inference, I am unable to state, that his illness was in some mysterious way attributable to the driving in of the cancer; but judging from his report of his condition to me later, together with the fact that some five days after he was taken he vomited some spinach eaten before his illness, it seems more probable that his condition was one of acute indigestion with auto intoxication from the gastro-intestinal tract.

Immediately following his illness he went to his country place for the summer, first coming to my office to report that while he was in bed all signs of disturbance of the face had apparently disappeared, but that should there be any recurrence of disturbance he would return for further treatment. Late in October he came back to me with some evidence that the trouble was not entirely gone. There was little or no induration, the majority of nodules had disappeared, but there were two small elevations covered by a yellow scab. Following two treatments there was a decided irritation of the whole cheek with some swelling and a good deal of burning pain. This persisted for a week or more, since which treatments have been resumed at weekly intervals, and at the present time there is one dry scab with no surrounding irritation or induration, and treatment is suspended until this shall drop off that underlying conditions may be more accurately observed.

Possibly this report may be a little premature, but it showed so beautifully in its earlier portion the cumulative effect of the

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X-ray, and the inference as to metastasis expressed by his physicians makes such a good text for a short sermon upon caution in condemning that with which one is little familiar that I cannot refrain from presenting it now. I have consulted all available printed authority and I cannot find that in the judgment of those who have had wide experience, metastasis can or does occur from removal of so small a lesion by means of the X-ray.

Case IX. A young married woman came to my office November 29th with the following conditions: For some more than a month she had noticed that she was having an undue amount of discomfort from her collars, which were of the prevailing stock pattern, and that from pressure on the neck, even from lying down there was a suffocating sensation. Just before her coming to me she discovered in the neck quite a sizeable lump, which was the immediate cause of her visit. In trying to remember the first signs of discomfort she could recall that early in September, while having a garment fitted, there seemed to be an undue tightness about the neck, which necessitated alterations being made. I found the right lobe of the thyroid enlarged to the size of a fig, the circumference of the neck over the tumor being 13⅛ inches. The tumor was freely movable, rising with deglutition, not tender at all and no signs of general disturbance. Diagnosis of simple goitre was made and treatment for ten minutes with a high tube, the anode at one foot from tumor, followed by five minutes of brush discharge was given. This was repeated at intervals of three days, increasing the time of exposure to fifteen minutes. Up to December 10 six treatments in all were given.

At the time for the seventh treatment there were present the following conditions which made it seem advisable to postpone: a dull congestive headache with pressure at the base of the brain, attacks of vertigo and occasional attacks of palpitation. There was also a return of an old endometritis which had not shown itself for more than a year previously. The headache and pressure continued for a week, gradually lessening and general disturbance disappearing altogether with the exception of an occasional attack of palpitation. At Christmas time, no further treatments having been given, the tumor was percep-

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tibly less, the circumference of the neck having been reduced to 12½ inches and the general discomfort much lessened. Treatment was resumed January 6 and has been continued up to the present day (February 7) at intervals of five days. The first two treatments were accompanied by a slight circulatory disturbance, but there has been no such effect from later ones. The diameter of the neck is now 12⅛ inches, the hypertrophy of the right lobe has disappeared, but there is present a slight enlargement of the isthmus perceptible by palpation and slightly noticeable upon deglutition and even this is noticably less at each treatment.

The symptoms in this case so closely resembled the physiological effects following the administration of thyroids that it seemed as though they might have been produced by the rapid absorption of that gland within the body. I shall await with some impatience the opportunity of observing the effects upon a goitre of older growth, both as to the possibility of rapid reduction and the appearance of similar conditions of general disturbance.

Case X. This patient, a college girl, was referred to me for recurrent cervical adenitis. There was enlargement of the right cervical glands to the size of a small hen's egg, which has been present for about three months. It was painful, sensitive to the touch, and there was a condition of general debility present, which made it necessary for her to give up her work in part. The complete history of her trouble was as follows:

Early in the spring of '97, following a general run-down condition, the enlargement first appeared, persisting for some months, reducing from treatment which improved general conditions. It reappeared in the spring of '99, subsiding to reappear in 1900 following at attack of tonsilitis; once more it yielded to general treatment, but recurred in 1902 subsequent to measles, this time for the first time showing signs of tenderness and yielding still more reluctantly to treatment. Its fifth appearance was early in the present year, brought on this time by exhaustion from over study; it was decidedly painful and failed to respond to measures which had heretofore been successful in removing

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Left side of neck; not exposed to X-Rays. (Case X.)



Right side of neck showing lock of hair about 3 inches long, which appeared after X-Ray exposures. (Case X.)

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it, and the question of operative measures was seriously considered, but it was decided first to make a trial of the X-ray.

The first treatment was given for ten minutes with a high tube, the anode at one foot distance, which was followed in a few hours by a bright flushing of the neck over the area exposed, lasting for some ten or twelve hours. This peculiar flushing followed all subsequent treatments, sometimes appearing before she reached her home from the office and persisting sometimes for twenty-four hours, but at no time was it at all irritating, resembling more the tonic effect of friction. From the very first application the tenderness began to disappear and at the end of half a dozen treatments the process of reduction was apparent. Between March 5 and July 25 eighteen treatments were given, with the result that in addition to the removal of all tenderness the circumference of the neck had decreased from 13½ inches to 12 inches, and while to palpation the gland was still somewhat enlarged, it presented little or no visible deformity. Meanwhile the general health was much improved and she was able, without other than normal fatigue, to assist actively in the preparations for the National Teachers' Convention held in Boston during the month of July, a work which was a severe mental and physical tax for all concerned in it.

During her summer vacation there was a still further reduction of the gland and her general health continued to improve, as shown by a gain of twelve pounds in weight. In the fall she was able to take up her complete college work. I did not see her again until the middle of December, when I found conditions much improved since I had last seen her and there had been one remarkable result not laid down in the books. During the summer a new growth of hair had made its appearance, extending downward along the posterior border of the sterno-cleido-mastoid for an inch or more lower than on the opposite side, and which had attained a length of nearly two inches when I first saw it. There was also a more vigorous growth of hair along the lower border of the right cheek, although the face had been carefully screened with sheet lead and rays could have reached it only by diffusion. It seems

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probable that the increased activity of the hair follicles was in some way connected with the tonic effect of the ray as manifested by its peculiar action on the skin in this particular case. Whether this effect is to be set down as attributable to idiosyncrasy or whether it opens a new field of work with hope for bald heads and beardless faces remains to be seen, and I am hoping in the near future to make some experimental investigations along this line. As I saw the case in December, 1903, the gland was not absolutely reduced to the size of its fellow on the opposite side, but it was free from the least sign of tenderness and had not been in the least disturbed by a sharp febrile attack in the early winter which would formerly have been the signal for trouble.

Inasmuch as previous attacks had occurred in the late winter or early spring, I deemed it best to resume treatments after the holidays, and in accordance with this idea she returned to me on January 18 for her first treatment. She was then getting over a cold, which had produced some tenderness upon the opposite side of the neck, but unaccompanied by any glandular swelling, and the gland which had been the seat of the original trouble was not in the least involved. I gave her a fifteen-minute treatment with a tube backing up a six-inch spark, the anode one foot from and directed at the right gland. The treatments have been repeated at intervals of one week, the very first one being followed by entire relief from all soreness of the neck. Up to the present date (February 6) four treatments have been given, none of which have been followed by the least indication of the old flushing. The gland is now the size of a pea bean, soft and with indistinct outline.

Case XI. This was also a case of cervical adenitis occurring in a lad of 12, four months previously, which had suppurated, was incised, and when it came under my observation was still discharging slightly and the gland was still enlarged. There was an irregular scar an inch or more in length, along which were several points covered with moist, yellow scabs, presenting an easily bleeding surface when removed and rapidly reforming. From the middle of October to Christmas eighteen treatments were given, with the result that the glandular enlargement gradually reduced, the scabs dried up one by one, not to

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reappear, the last one coming off during the Christmas vacation.

Case XII. I have now to record my one absolute failure. The patient is a man of about seventy, of feeble health and subject to attacks of syncope, who has at the angle of the thumb and forefinger of the left hand an epithelioma nearly two inches in diameter. This appeared about seven years ago, following his own treatment of a wart at that point with his pocket knife, and has been gradually developing from that time. When I saw it, it was painful, discharging rather freely, somewhat offensive at times and surrounded by a dark red areola three-quarters of an inch in width. At the lower border there was a redundant, cauliflower-like growth involving about a third of the whole sore. At the end of the third treatment there seemed to be a decided improvement, the surrounding areola had entirely disappared, there was a clean-cut edge to the ulcer, the superfluous tissue seemed to be shrinking, the soreness had decreased and altogether there seemed to be promise of good results, but from that time it made no apparent gain, the discharge became more constantly offensive, the pain increased, the hand was more swollen at times and there was enlargement of the axillary glands, the superfluous tissue became necrosed and the general lack of apparent benefit was so marked that he became discouraged, deciding to discontinue treatment, promising to report to me should there be material change one way or the other. I have not as yet seen him and there is still the forlorn hope that the apparent aggravation may be followed by an equally decided favorable secondary effect. In this case I departed from my usual use of a high tube when I found things not progressing, but low tube, brush discharge and all, seemed to be of no avail.

One of my most satisfactory results was obtained entirely by accident. During the fall a young man while hurrying from his yard in the dark, came into collision with a large dog, which event, while so far as heard from did not injure the dog, was of more serious consequence to the young man. He fell violently to the ground, striking on his forearm and elbow, producing extensive abrasion which was followed by a swelling

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of the whole arm and hand and the appearance of a large fester on the tip of the elbow. The arm, aside from being swollen, was extremely painful and helpless. While there was present no indication of fracture, he was referred to me for the purpose of making a plate that bone injury might be determined. A five-minute exposure with anode at 16 inches was made to obtain the plate, which, in a moment of mental aberration, I attempted to rinse after fixing under the hot water tap, much to the detriment of the plate. It became necessary to make a second sitting, at which time he told me that since the first plate was made there had been much less pain and that the swelling was diminishing. Following the second exposure he telephoned that Dr. P. wanted him to find out when he was to come again. I told him that the last plate had been entirely satisfactory and that a third attempt would not be necessary. "But he wants me to come for a treatment." The result was that three treatments of fifteen minutes, with a high tube, anode at one foot, were given on alternate days, which entirely reduced the swelling and removed all other signs of disturbance.

All of my work has been done with a medium to high tube, at first rather by accident and largely due to the fact that my earlier tubes were not of the adjustable variety, and it was a hard matter to reduce them to the desired point by baking. Later I noticed that while I seemed to be getting the desired results, I was not getting the dermatitis which at that time was considered an almost necessary accompaniment to the use of the X-ray, and I was getting so many indirect reports of friends and acquaintances of patients who had been "burned" that I have striven to avoid as unnecessary the production of skin irritation, believing that my best results have come from the tonic rather than the destructive action of the ray, also that a point short of destructive effect upon healthy tissue has seemed to be sufficient for the destruction and absorption of morbid tissue. In this deduction I seem to have a growing support from the reported observations of others.

As to the choice of apparatus, having used a coil in my work at Newton Hospital and a static machine in the office, I would say that I much prefer the latter except in radiographic work

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of deep tissues, largely from the fact that it is so much easier to be sure of a practically constant vacuum during an entire exposure, while with the coil the tube, having rapidly gone up, is as suddenly reduced and one can never say with exactly what vacuum a case has been treated, other than in a general way. For the last nine months I have been using tubes with the platinum adjustment, which I have found most satisfactory, and it seems that by the method of attachment which I have adopted I am sure of working with any desired degree of penetration throughout an entire treatment.

It is my plan to reduce the tube to the point where it will back up a two or three inch spark between sliding rods on the machine, a multiple spark gap is introduced into the circuit on the negative side of the tube, the sliding rods on the machine are separated to four or five inches, as the case may be, and the multiple gap adjusted till there is a spark across rods; they are then drawn half an inch farther apart and as sparking occurs the gap rod is pushed in until it ceases. In this way it would seem that an accurate gauge of the tube is obtained and one is able to make successive exposures under practically similar conditions. Other tubes are maintained at varying states of exhaustion that all requirements may be met. This particular make of tube, while of moderate cost, has seemed to possess good therapeutic value and has done excellent work on plates, a good picture of an old fracture of the neck of the femur having been obtained with an exposure of eighteen minutes.

One of the particularly noticeable results obtained by the use of the ray is the relief of pain, and this takes place sometimes incidentally while making even the limited exposure necessary for plate work. This has been particularly evident in the case of old injuries involving joints; acting on the suggestion imparted by these incidents, I have obtained absolute relief from pain in several excessively tender bunions in two or three treatments.

Altogether there seems to be a field of usefulness for this class of therapeutic work which as yet is barely entered.

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LIGHT THERAPY.*

By Russell H. Boggs, M. D.,
of Pittsburgh, Pa.
Radiographer to the Allegheny General Hospital, Etc.

The idea of using light as a therapeutic agent is ancient, but practical devices for the purpose are comparatively recent. Many centuries ago the value of sunshine and sun baths was recognized. Among the Romans exposure of the body to the rays of the sun was practiced not only for the curative effects on numerous diseases, but as a prophylactic measure as well. In nearly every Roman house space was arranged on the roof for a sun bath. In crowded cities it is practically impossible for the inhabitants to secure sufficient light and oxygen. This is the cause of many diseases. Practically the same result is produced on the body by the electric light when properly concentrated and applied as sunlight. The many cases treated in this way have proven this to be a fact. It is evident that it is the actinic rays of light, which are blue, violet, and ultra-violet, that produce the most beneficial results. However, even heat rays have some influence, and must not be totally disregarded.

The greatest heat rays are beyond the red, called infra-red. After many experiments it has been found that yellow rays of the spectrum have the greatest luminous power, and the violet least. These several rays can be separated or filtered out from the compound rays of light by employing colored glass or other media. A solution of alum allows the luminous rays to pass, but excludes the heat rays. A hollow convex lens filled with a solution of iodine in carbon disulphide permits the passage of the heat rays, but excludes all luminous and chemical rays.

Red and yellow allowed to fall upon a mixture of hydrogen and chlorine produce no effect, while the violet rays would cause an explosion by inducing chemical action. All rays of light have the power of penetrating the body to a certain extent, but the rays of longer wave length and the least chemical action have the greatest power of penetration. It has been

*Read before the Pittsburgh Academy of Medicine, Jan. 26, 1904.

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shown by placing silver chloride in sealed tubes under the skin of animals, that it will be blackened when they are exposed to strong light, thus proving that the tissues can be penetrated by the chemical rays of light. The pigmentation of the skin is a protection against the chemical rays. White cows are sunburned the same as white people, while dark colored animals, as well as negroes, are protected by their color; the pigmentation that occurs with sunburn prevents recurrence. Even if the accumulation of heat is increased by the color of the negro's skin, the impenetrability to the actinic rays renders him better able to endure exposure to the sun.

In considering light therapy, the incandescent lamp has a place, but in most pathological conditions the electric arc offers by far the best means of securing the greatest number of chemical rays, as well as the highest value in radiant energy available from an artificial source. Sunlight is the cheapest source of phototherapeutic energy, but it is not to be relied upon in our temperate zone, as its use would be restricted to a few hours on certain days. Then, again, the solar spectrum is so full of absorption bands that some of its rays are very small in quantity. The earth's atmosphere is a great absorbent of ultra-violet rays, and this action becomes enormous by the time the rays reach the earth. The light obtained by gas or oil is not worthy of consideration, as their actinic energy is extremely low, while the quantity of heat rays is very great.

The chemical rays of light can be localized and intensified by some form of a modified Finsen apparatus, or the entire body can be illuminated by an electric bath cabinet. The value of light is not, as many seem to think, confined to superficial diseases, but has a broader place in medicine, as has been shown in treating deep-seated lesions with a powerful arc. Actinic rays in too large amount are injurious to the tissues, while the proper amount is beneficial, and the evidence which is rapidly accumulating confirms this.

The chemical activities of light have been shown in the treatment of pulmonary tuberculosis, as well as in superficial tubercular lesions. Nearly all cases treated by this method have shown improvement, which is more than can be said

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of medical treatment. Excellent results have been attained in the treatment of psoriasis, eczema, lupus, acne, tubercular joints, fistula, etc.

It has been found that solarization of the nude body by the sun and electric arc rays produced marked influence upon iron preparations after their internal administration. All the per-salts of iron, when in combination with organic matter, are converted into proto-salts. It has been proven that in many tubercular and anæmic patients to whom the different iron salts were administered, the blood count under daily exposure to the action of electric rays showed marked improvement in the matter of erythrocytes and hæmoglobin. The increase is very marked compared with the cases treated without the influence of light. Eskimo women suffer from amenorrhea during the winter months.

Light acting on the surface of the body revivifies the corpuscles of the blood, combating the anæmia; increases the number of red corpuscles, thus improving nutrition, and restores the healthy tissue. The dilation of the capillaries of the skin produced by light is not a rapid process, which passes away quickly, but is really of long duration, and the result is in the determination of a more active supply of blood to the part, which in turn influences nutrition. During the operation of an arc light, ozone is produced in large quantities, which also has a marked influence. The healthful influence of mountain and seaside depends largely upon the amount of ozone present. Children who are more exposed to sunshine are much healthier and less subject to rickets, tuberculosis and other grave disorders. It has been said that cretinism is more frequently found in valleys where there is little sunshine.

The marked nutritive effect of light on plants is noticeable from the outset. Plant growth seems especially influenced by yellow rays. Ultra-violet rays increase flowering, while red light increases the aroma. Blue light retards growth. It is a well-known fact that the human system requires for its nourishment plenty of light and air. People who work in offices and stay inside nearly all their lives soon become bloodless and pale.

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The use of the electric light bath as a powerful stimulant has been well established. If at the beginning of the bath the temperature is 80°F. in three minutes it will rise to 90°F., and in ten minutes to 115°F. The bath is well ventilated. After the patient is exposed to the light for two minutes, and the bath is now only 90°F., there is usually sufficient activity of the skin produced to start perspiration on the parts where the light is most intense. This certainly proves that the sweating is caused by the radiant energy, and not by the contact of the heated air with the body. Perspiration is profuse in from six to ten minutes. Besides the sudorific action of electric light on the skin, draining of water, salts, and excrementious matter, there is a decided tonic effect. Certain degrees of nervousness and insomnia are benefited. In all cases the elimination of urea is increased. Under the influence of light more carbon dioxide is eliminated than when confined in the dark. The body loses more weight in daylight than at night, though equally quiet. Heile has shown when crabs were painted with dark varnish they would die quickly, but with light colored varnish they would not be affected.

In France the general electric light bath has been used successfully in promoting the absorption of exudates in the cornea of the eye. Very gratifying results have been observed in promoting the absorption of exudates from the pleural and peritoneal cavities. Direct action upon chemical processes and stimulation of the functions of the tissues are the consequences of exposure to light. First of all, the effect is noticed on the skin. The skin is an exceedingly important organ of metabolism, and its functions are more often neglected than those of any other organ, as before stated.

It can hardly be expected that light acts as a germicide in deep structures, and this is not even necessary in order for it to be effective. Light is principally indicated in chronic disorders of hemogensis, derangement of digestion and during convalescence from exhausting diseases. The specific effects have been observed in the judicious employment of light in the treatment of chlorosis, anæmia, scrofulosis, rheumatism,

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gout and some forms of neuralgia. Marked results have been obtained in auto-intoxication and the neuroses depending upon them. In nephritis electric light has been employed successfully. In treating the above, unmodified light, consisting of heat, luminous and chemical rays, is used. For skin affections, chemical rays only are necessary, while, on the other hand, in the treatment of variola the chemical rays must be excluded. In 70 cases Finsen found that by excluding these rays, when patients were only exposed to red light suppuration and suppurative fever, as well as pitting, were prevented.

Editorial.

THE NEED OF A SECTION ON PHYSICAL THERAPEUTICS IN THE AMERICAN MEDICAL ASSOCIATION.

At the Atlantic City meeting of the Association, just closed, a singular anomaly was observable. The large exhibit on the pier was made up, in great part, of machines and apparatus for the employment of the physical forces in medicine and surgery; yet, so far as the writer is aware, no papers appeared in the programmes of the sections relating to the questions of the technic and value of these forces, with the sole exception of radiotherapy.

That this absence of papers and discussions on electrotherapy, radiography, thermotherapy, massage, vibrotherapy, etc., was not due to an absence of interest in these themes, is evident from two primal facts—(1) a number of papers which were offered on these subjects failed to get on the programmes for lack of room; (2) several manufacturers exhibited apparatus for the application of forms of physical therapy, incurring considerable expense in securing space for such exhibition and in transporting such apparatus to the seaboard far away from their showrooms, which indicates that large numbers of physicians are investing money in these instruments

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as an additional means for the diagnosis and cure of disease.

The American Medical Association should be the clearing-house of catholic medicine. Her arms should not only enfold, but nurture, all scientific phases of the healing art. To this jury of inquiry and arena of scientific criticism all America looks for the separation of the wheat from the chaff. On her breadth of sympathy depends the question whether the fine grains of wheat shall be cared for, or the mass of wheat and chaff together shall be left rotting on the roadside.

Under these patent circumstances it becomes a question whether the Association is doing its duty toward those physicians who, in such large numbers, have recently become interested in physical therapeutics, and who seek additional light on the profound problems confronting them daily in their practice. The Association owes it as a duty to the profession, as well as to science, to so guide these new energies that all shall develop fully within the limits of its ethical brotherhood.

The British Medical Association has already established a section for electrotherapeutics, the first meeting having been held last year. A broader terminology would also include other allied forces of nature in the proposed new section of the American Association.

Let us have a Section on Physical Therapeutics.

THE AMERICAN ROENTGEN RAY SOCIETY.

The idea of forming a special American society for the study of the X-Ray, which has reached its culmination in the organization of the American Roentgen Ray Society, was conceived by Dr. J. Rudis-Jicinsky of Cedar Rapids, Iowa, in 1898. He communicated his plan to a number of the X-Ray workers of the United States and Canada and a preliminary meeting was arranged for at St. Louis, Mo., in 1899. At this meeting plans of organization were discussed, the name, Roentgen Society of the U. S. was adopted, Dr. Heber Robarts of St. Louis was elected president, Dr. J. Rudis-Jicinsky of Cedar Rapids, Iowa, secretary, and it was decided to hold the first annual meeting at New York, N. Y., in December, 1900. The gratifying success which attended the first annual meeting was due

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principally to the indefatigable exertions of Dr. Jicinsky, who wrote over twelve hundred letters with his own hand in the interval between the preliminary meeting and the first annual convention, in addition to arranging the details. A splendid exhibit of X-Ray apparatus was provided by various manufacturers under the direction of Dr. S. H. Monell of New York, N. Y., who served the society most faithfully as chairman of the committee of arrangements. Dr. Robarts was re-elected president, Dr. Jicinsky was re-elected secretary, and Dr. E. A. Florentine, of Sidnaw, Mich., was elected treasurer. It was decided to hold the next annual meeting at Buffalo, N. Y., in September, 1901.

At this convention the Society underwent the travail which would determine its future line of development and emerged from the struggle as a scientific organization of high grade, which character it has maintained up to the present time. The name of the organization was changed to the American Roentgen Ray Society, Dr. G. P. Girdwood of Montreal was elected president, Dr. James B. Bullitt of Louisville, Ky., as secretary, Dr. Florentine as treasurer, and it was decided to hold the next annual convention at Chicago, Ill., in December, 1902.

At the Chicago meeting a program of fourteen papers was presented which were extensively and earnestly discussed, and a large exhibit of X-Ray apparatus was provided under the efficient direction of Dr. Ralph R. Campbell of Chicago, Ill., who served as chairman of the committee of arrangements. Dr. Arthur Willis Goodspeed, assistant professor of physics at the University of Pennsylvania, was chosen president, and Dr. Bullitt, secretary, and Dr. Weston A. Price of Cleveland, O. as treasurer. It was decided to hold the fourth annual convention at Philadelphia, Penn., in December, 1903.

A program of nineteen papers was presented at the Philadelphia convention and an interesting exhibit of X-Ray armamentaria. It was the most successful of the meetings so far held as regards enthusiasm and results attained. By invitation of the authorities of the University of Pennsylvania the sessions were held in Houston Hall, one of the University build-

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ings, and by invitation of the provost of the University lunch was served to the members free of charge at the Houston Club. This cordial recognition of the scientific standing of the Society by one of the greatest seats of learning in the United States, has done much to strengthen the organization and its prospects for future development are as bright as could be wished for. Dr. James B. Bullitt was elected president, Dr. Russell H. Boggs of Pittsburg, Penn., secretary, and Dr. Weston A. Price was again elected treasurer.

The next annual convention will be held at St. Louis, Mo., on September 8th, 9th, 10th, 12th and 13th, immediately preceding that of the American Electro-Therapeutic Association, which meets there September 13th, 14th, 15th and 16th. By holding the convention at this time the members will be enabled to attend the sessions of the last named organization as well as those of the International Electrical Congress, which also meets at St. Louis, September 12th to 17th. It is to be hoped that in the future the American Roentgen Ray Society and the American Electro-Therapeutic Association will hold their annual conventions at the same places and at nearly the same times, so that the members of each body will be able to attend the sessions of the other. There is indeed so much in common between them that the possibility of the amalgamation of the two organizations at some future time is a topic worthy of discussion.

The members of the American Roentgen Ray Society number over two hundred and seventy at the present time. Requirements for membrship are that the candidate must be interested in the development of the X-Ray, be recommended by at least two members in writing, and be approved by the executive council, which must be convinced of his good ethical standnnual dues are five dollars.

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Miscellaneous Abstracts.

A COMPARISON OF TREATMENT OF SKIN DISEASES BY PHOTOTHERAPY, RADIOTHERAPY, AND HIGH FREQUENCY CURRENTS.

By Charles W. Allen, M. D., of New York.

This paper, which was read before the Section on Cutaneous Medicine and Surgery at the fifty-fifth annual convention of the American Medical Association, which has just been held at Atlantic City, N. J., embodies the results of study of the comparative value of newer methods in cutaneous medicine and is based upon the writer's experience covering some seven hundred patients and representing a great variety of skin affections, including nearly one hundred cancers and such rare affections as mycosis Fungoides and xeroderma Pigmentosum. Naturally the greatest field of utility for the violet and ultra-violet rays is that embracing lupus. While he recognizes the great value of phototherapy as carried out in Copenhagen and elsewhere, chiefly by the methods as laid down by Finsen himself, and those which closely approximate them, still the writer believes that the X-ray may give equal results.

Radio-therapy is regarded as the superior method for the great majority of skin affections, high frequency currents have been used in some two hundred and fifty cases, extending over a period of two years or more, and the result of the observation is that while they are distinctly useful as adjuvant to other treatment, their great value lies aside from d'Arsonvalization, in the spark from a carbon or other electrode employed in such a way as to destroy new growths and cutaneous lesions. A brilliant future is predicted for this form of high frequency application. The statement is made that individual lesions of lupus, lupus erythematosus, psoriasis, lichen planus and other diseases may be eradicated in a single sitting.

A dry flat scaly lichen planus lesion may be transformed into a bullous lesion, as the author has previously pointed out, by curretting or scraping. In the same way this transforma-

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tion may be effected by the application of the high frequency spark. Once transformed, the blood blister or water blister thus produced is usually the equivalent of cure, since when the resulting crust falls off the original lesion has disappeared. The general conclusions of the paper are, that while each method has its own decided sphere of utility, each may enhance the other, and all three may be combined at times in a single case.

The writer mentioned a subject of mycosis fungoides, referred to him by Dr. S. Sherwell for ray treatment, in whom the lesions have almost entirely disappeared without the production of dermatitis.

X-RAY THERAPY IN SKIN DISEASES.

By G. E. Pfahler, M. D., of Philadelphia, Penn.

This paper was read before the Section on Cutaneous Medicine and Surgery at the fifty-fifth annual convention of the American Medical Association, which has just been held at Atlantic City, N. J.

Two cases of nevi were reported. One was cured after the production of a mild dermatitis, by eight exposures, in six weeks. The second cases was one in which almost half of the body was involved. It was much improved after sixty treatments. From this method of treatment of nevi we may expect marked improvement, but not absolute cure except when treatment is forced to the extent of ulceration, which is not always advisable.

The report of a case of lupus vulgaris involving the nares, and the mucous membrane on the inner surface of the lips, of five years' duration, showed a disappearance of the lesions except a nodule on the ala of the nose, after thirty treatments in eight months.

A case of epithelioma of the lower lip was reported which at the beginning of treatment showed distinct involvement of the submaxillary glands. These disappeared after five months, but the growth itself yielded slowly. It was removed by operation and then treated with the X-ray for a month, with success. The case shows the advantage of combining surgery and the X-ray.

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A case of morphea in which the patch was about three inches in length and one and a half inch in width, showed a disappearance of the lesion after eighty treatments in eighteen months. It had existed four years before treatment with the X-ray.

The following conclusions may be drawn from the treatment of acne:

1. It meets the indications more satisfactorily than anything else.
2. Relapse is not frequent as in the older methods and is slight.
3. No burns of any serious degree are necessary during the treatment.
4. If the treatment is not forced to the extent of a burn there is probably no danger of atrophy of the skin.
5. No reaction should be produced beyond a mild erythema and this degree should be reached slowly.
6. It is not necessary to produce an erythema, but if the treatment is carried to this degree the results will be hastened.
7. The hair, eyes, and eye-brows must be carefully protected.
8. A tube with a vacuum which will back up a two and one-half inch air gap, at a distance of 10 to 12 inches, with a current of 2 to 5 amperes, for 5 to 10 minutes on the area treated will probably give the best results.
9. In the average case about three months' time and 20 to 30 treatments will be required to produce a cure.

ON RADIOTHERAPY (PRESENTATION OF PATIENTS AND PROJECTIONS.)

By O. Lassar, Berlin, Klin. Wochenschrift, 5-16-04.

The author has treated melanomata and cancroids with radium and comes to the conclusion that pathologic neoplasms can be cured with this method, which is simple compared to other radio-therapeutic measures and can be employed by any physician.

The part on Roentgen rays contains nothing new; but it is of interest to note that the author is less pessimistic than others and believes that carcinomata, especially skin cancers, are

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healed by the X-ray. "There may be the objection that recurrences may appear, but the recurrences should not be prevented, and the ones already present should be brought under the favorable influence of the ray and even if further new ones shall appear, the harmless form of radiation can be used again."

OPERATIONS UNDER IMMEDIATE GUIDANCE OF ROENTGEN RAYS.

By Prof. Dr. Perthes, (Zentralblatt fur Chirugie, 5-7-04.)

To utilize the Roentgen Rays during operations, the surgeon, without having to depend on assistants or without having to touch the fluorescent screen or switches, must be enabled at any moment to darken the room, to intercalate the Roentgen light, to bring the fluorescent screen into position.

This is accomplished by a wooden table with a Roentgen tube under the plate and a fluorescent screen above. Three pedals under the table can be made use of by the surgeon. Pedal 1 elevates or lowers the fluorescent screen; pedal 2 cuts out (or in) the electric light of the operation lamp; pedal 3 closes the primary of the coil, thus bringing the tube into action.

The lower part of the body of the surgeon is protected by lead foil against the effects of the Roentgen tube situated right in front of it. The table is constructed chiefly for operations on the upper extremities and has been successfully made use of in extraction of foreign bodies.

ON THE EFFECT OF ROENTGEN RAYS ON INTERNAL ORGANS.

By Dr. H. Heineke, Muenchener Med. Wochenschrift, May 3, 1904.

The author used hard and medium Volt-ohm tubes, 60 cm. (24-inch) coil, slow mercury interrupter (sometimes also Wehnelt), weak current. The tube distance was from 5 to 20 cm. (2 to 8 inch). The animals radiated were guinea pigs, mice, rats, dogs and rabbits.

Changes have been noticed in the follicles of the spleen and in all lymphatic glands of the body, in the follicles of the alimentary tract and in the thymus of young animals.

After four hours of irradiation large phagocytes can be seen

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which entirely disappear in from 24 to 36 hours afterwards. The follicles, i. e., their specific elements, the lymphocytes, have, according to the intensity of the rays, more or less perished in the meantime.

The author advises a trial with Roentgen rays in pseudoleukemia, chronic tumor of the spleen, malignant lymphoma and lymphosarcoma and the different forms of leukemia.

THE APOSTOLI TREATMENT. THE FINAL RESULTS OF ITS USE IN SOME CASES OF FIBROID TUMOR OF THE UTERUS.

G. Betton Massey, Jour. A. M. A., May 21, 1904.

An inquiry into the after history of 110 cases of fibroid tumors treated by the Apostoli method are reported. The intervals since the termination of the treatment varied from three to sixteen years, giving an opportunity to thoroughly estimate the real value of the treatment to these patients.

Of the 110 cases the results could not be ascertained in 9 patients, mainly former attendants on a public clinic whose addresses were unknown. Of the remaining 101 cases 75 were successes, including 18 cases in which the tumor disappeared, and 26 were failures.

The successful cases included a number of patients who had been condemned to hysterectomy who are now in the best of health, either without a vestige of the tumor remaining, or, in some cases, unconscious of the presence of a remnant that could still be found by careful examination.

Of the failures, all but one were left in a position to accept operation if they wished, the exception being a death from septicaemia in case of cystic intra-uterine growth. The conclusions drawn were as follow:

"(1) A prolonged observation of cases of fibroid tumors of the uterus under the Apostoli treatment teaches that three-quarters of the cases subjected to the method will be practically cured, as attested by inquiries made from three to sixteen years after the cessation of the treatment. (2) The cases that responded poorly or not at all to this treatment are not harmed by it, when properly applied, and heroic measures may then be adopted with the certainty that milder means are of no

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avail. (3) Hemorrhagic and interstitial fibroids are best adapted to the Apostoli treatment while subperitoneal or degenerated fibroids and those complicated with pyosalpinx are least adapted to be relieved by it. (4) So far as my inquiries and circulars show, there have been but seven deaths among these 110 patients during the sixteen years or less that they have been under my observation. It is an interesting fact, moreover, that but one of these deaths was due to the progress of the growth itself, proving the non-mortal character of this affection. Of the remaining six, one died long after treatment of an affection totally unconnected with the growth, one of septicemia under electric treatment as related and four while being operated upon by the knife."

ROENTGEN RAYS IN THE TREATMENT OF CANCEROUS AND SKIN AFFECTIONS, EPILEPSY AND DIAGNOSIS.

J. Herman Branth. N. Y. Medical Journal and Phila. Med. Jour., June 14. 1904.

Branth considers that in epilepsy, rodent ulcer, lupus and some other skin affections the X-Rays prove an almost certain remedy. In more deeply located cancer the results are variable, and the deeper the cancer the greater the difficulty in conquering the disease. In nearly all cancers of the breast which he has had under treatment the disease has been brought to a period of rest and further development prevented for a time, but he has never seen a single case of mammary cancer recede into a normal condition through the agency of the X-Ray treatment alone.

Dr. Branth has treated a number of cases of epilepsy with the X-Rays, he being led to do so by the generally prevalent impression that the X-Rays stimulate protoplasm into greater vital activity. He gave three treatments a week, beginning with five minutes' exposure at fifteen inches distance, and by degrees increasing to ten minutes at ten inches distance. A different part of the skull was exposed at each sitting and rays of high penetration from a tube backing up a sparkgap of from five to ten inches with five to ten sparkgaps in circuit was used. The hair is likely to drop out in the areas treated, but it returns later in stronger growth than existed before.

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In some cases the administration of bromides may be dispensed with, but in some cases he has found it beneficial to continue with the bromides in small doses.

In one case of severe epilepsy which had grown steadily worse under bromides and in which severe mental symptoms had become evident, no spasm has taken place since the treatment was begun. The patient gained nine pounds in four weeks and has become a bright boy with such improvement in his mental condition that he now stands in the front rank of his class at school. Several other cases were referred to and in all the gain in weight and improvement in the mental faculties is very marked. He has seen the impediment of speech which occurs in the severe types of epilepsy of long standing disappear under the X-Ray treatment. Patients who were having from six to eight seizures a day, after receiving treatment for a few weeks, would go two and three weeks without having any seizure. These results in this disease are of great interest and importance and it is to be hoped will be confirmable by other operators.

General uses of the X-Ray in diagnosis, more especially in the detection of foreign bodies and bone pathology, are mentioned. By photographing the hand of a mummy, Branth demonstrates that rays will pass through dead and lifeless tissue and that they are therefore of no use as a test for the existence of life.

He prefers a static machine as a tube excitant having at least twenty revolving plates of from twenty-eight to thirty inches in diameter. With a machine of this size it is possible to energize two X-Ray tubes of five inches spark resistance each connected in series, and to do entirely satisfactory radiographic work with each tube.

RADIUM AND RADIO ACTIVITY.

Robert Abbe, Yale Medical Journal, June, 1904.

The way in which Madam Curie came to discover radium was described interestingly and at considerable length, and several specimens of radium of different degrees of radio-activity were exhibited. The actual radio-activity of a specimen of radium can not be judged by its luminosity, some very weak

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specimens showing a large degree of luminosity in the dark. Dr. Abbe stated that the German radium denominated 1,000,000 strength is scarcely as strong as that made by the Curies and denominated 300,000; a statement which assumes an aspect of great importance from the fact that both French and German radium are in use.

The destructive effect of radium exposures upon seeds, ants, young mice, Guinea-pigs, etc., are enumerated and the effect of radium with light rays of different wave lengths was ascertained as follows: Professor Abbe planted in sifted soil a hundred plain rape seeds and in separate patches of earth the same number, after four days' exposure of radium. The same procedure was gone through with seeds which had been exposed ten days to radium, others after exposure to the X-Ray. Others were planted without any exposure, but under a ruby-red glass, blue glass, yellow glass and still others were exposed to concentrated light behind large lenses before planting. White glass covered all but the colored ones, so as to maintain identical atmospheres.

The seeds sprouted and continued to grow in the following order: Yellow, red, blue, sunlight, plain and radium. At the end of ten days the scale of growth was from one inch for plain, to two and one-half for yellow. At another time plain and radiumized were tested, and at two weeks the plain were nearly seven inches high; the four days' radium exposure, five inches; two days' exposure, three inches.

The pathology of a radium burn, which requires from three to six months to heal, was studied microscopically by means of tissue which had been burned and excised. The findings were as follows:

"First. On the skin, a superficial necrosis of cuticle always takes place; for longer applications, a deeper and deeper devitalization of cells.

"Second. Leucocyte infiltration shows about all vessels and nerves; the latter explains the intensely painful sores.

"Third. Where an area of cancer underlies the skin, a softening and devitalization of the central cells of nests nearest the radium takes place.

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"Fourth. Where the radium tube is thrust into the cancer, an area of complete destruction of the cancer cells for an area of not more than a quarter inch takes place."

A number of cases are quoted in which Dr. Abbe had used radium and which led him to conclude that it is frequently effective, therapeutically, in several diseases, prominent among which are lupus, superficial epithelioma, rodent ulcer and recurrent cancer nodules.

He is not prepared to state anything in regard to the efficiency of radium in the treatment of deeply located malignant processes, but from observations which he has made upon one case of sarcoma of the lower jaw, is inclined to think that it may ultimately prove useful.

The article concludes as follows:

"The use of radium has not yet passed the experimental stage; its energy would seem to be dependent on the activity of electrically charged particles, which have the power of penetrating animal tissues to various depths.

"Upon superficial healthy tissue they bring about necrosis by over-excitation; upon morbid cells they induce retrograde changes and a substitutive fibro-hyperplasia. It would be a matter of speculation whether the effect upon morbid cells is one of destructive action, or a healthful stimulation of weak, degenerate, over-grown tissues.

"Finally, its action is so like that of Roentgen rays, of the ultra violet and Finsen light, that its use may be applied along the same lines of treatment, with a different rating as to energy, being as many times weaker than the Roentgen rays as it is stronger than the Finsen light in lupus and allied troubles.

"It is yet possible that it may be found available for introduction into the substance of malignant tumors, illustrations of which have just been given."

A CASE OF SUPPOSED SARCOMA OF THE CHEST WALL SYMPTOMATICALLY CURED BY MEANS OF THE X-RAY.

By James P. Marsh, American Journal of the Medical Sciences. June, 1904.

The case is reported as a bit of evidence in support of the contention that the X-Ray is capable of exercising a curative

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influence in many cases of deeply located malignant disease. Patient was a schoolboy sixteen years old and exhibited a tumor three inches in diameter and projecting from the normal level of the chest wall about two inches, immediately beneath and just inside of the midportion of the left breast, and was not connected with the mammary gland. Growth was firm in consistence and firmly attached to the ribs.

It had been noticed seven months previously. Patient had previously been seen by Dr. A. J. McCosh of New York, who made a diagnosis of inoperable sarcoma. Pain had never been present.

From December 29th, 1902, to May 1st, 1903, the patient received twenty-six X-Ray applications to this growth, which resulted in complete disappearance of the tumor. On March 6th, 1904, patient was again heard from as being in perfect condition, no evidence of the tumor being in existence.

In the treatment of the case, Dr. Marsh used a Friedlander tube, giving rays of high penetration, backing up a sparkgap of from five to eight inches, excited by a twelve-inch Queen coil. The first three treatments were given with the glass surface of the tube ten inches from the patient's skin. The next two were given at a distance of five inches from the skin and the remainder, with the exception of one, at a distance of eight inches from the skin. The duration of each treatment was ten minutes. Temporary general febrile movement was observed after the second treatment and marked cachexia developed after the seventh. Reaction appeared after the thirteenth, disappeared after a few days, reappearing for a short time after the twenty-second. The growth began to decrease in size after the ninth treatment, and was very much reduced after the sixteenth, and when he came for the twenty-third treatment it had entirely disappeared, the patient had a good color and was perfectly well.

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Current Electrology and Radiology

(Only articles relating to the above-named subjects will be abstracted.)

JOURNAL OF ADVANCED THERAPEUTICS.

New York, N. Y., June, 1904.

1. The Employment of Static Electricity in the Treatment of Nervous Diseases, by William Benham Snow.
2. Perineuritis, by Almerin W. Baer.
3. A case of Asthma with Fibroids and Pelvic Adhesions Cured by Galvanism, by Charles Augustin Covell.
4. Cataphoresis, by James C. Gill.
5. A New System of High Frequency Therapeutics (Continued), by Frederick F. Strong.
6. Report of Committee on Current Classification and Nomenclature.

1. Snow holds that the electrical modality best suited to the improvement of general metabolism must be one of very high potential having great power of penetration and very small current flow. Hence the value of static electricity in those cases of nervous derangements dependent on deficient metabolism. This modality overcomes also local stasis and is therefore of value by dissipating inflammatory exudates and restoring tone and nutrition to parts locally affected. Neuritis, pachymeningitis, myelitis, anterior poliomyelitis and tabes are examples of diseases associated with local inflammatory processes and in some of these the judicious application of electricity is of essential service. Sciatic neuritis of recent occurrence seems to have been the disease most successfully treated, and the wave current, the method of application commonly employed. The electrode is placed over the exit of the nerve at the sacro-sciatic notch, beginning with as long a spark-gap as will be borne and increasing it gradually as the parts become more tolerant, for twenty minutes. Following this administration, sparks are applied, mainly to the same region and along the course of the affected nerve. In chronic cases, however, the sparks will be the main reliance. In the treatment of tic douloureax, the brush discharge, associated with the wave current is of considerable value. Anterio-poliomyelitis has been greatly benefited. The method of treating these patients has been the application of soft metal electrodes over the region of the cord corresponding to the part affected, em-

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ploying the wave current with an extremely long spark-gap, all that can be borne, which will depend upon the width and length of the electrode and the underlying tissues of the little patient. In the treatment of tabes, the static modalities are of value in controlling the pain and improving sensation.

2. Perineuritis of necessity includes endoneuritis, and epineuritis because of our inability to differentiate with a certainty between the afflictions of the nerve and its inner and outer sheath.

"The sufferer finds difficulty in straightening out the spinal column, getting the heel to the floor, and sitting comfortably, and is often unable to read or tolerate noise if any of the cranial nerves are involved.

"Diagnosis is all-important. Who has not seen a patient on whom we had spent our best endeavors for days or weeks, drop off to a confrere who recognized a slight pathological, easily-remedied condition which we overlooked or thought too trivial for consideration, and be symptomatically cured in one or two treatments to our chagrin?

"Careful inquiry will nearly always give us a clue as to the cause of the pathological condition and if it is in the facial region we must never forget the possibility of abscess, which electrical manipulation always aggravates and which is the best means of ascertaining whether a facial "Neuralgia" is caused by pus-forming organisms at the root of an apparently healthy tooth or is a neuritis proper, caused by some toxic principle, pressure caused by an embolus, arteritis, or swelling from any cause, including traumatism, and especially pressure on the nerve where it passes through a bony canal."

As we follow the spine downwards the cause of nerve irritations are usually found to be in "Cold," affecting the spinal nerves and gotten in all manner of ways, or traumatism; possibly a combination of both. When the trouble is acute and we use electricity in some form the patient almost invariably complains of increased pain for the first few treatments, because of the increased tension created. In the chronic conditions it is seldom that increased discomfort is caused in either anaemic or hyperaemic conditions, whether traumatic or not.

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The author gives the histories of four cases of perineuritis and their treatment. In every case recovery followed after a rather varied treatment of the static breeze, static spark, general static treatment and the "Direct and interrupted continuous current."

3. Covell describes a case of peculiar interest in which asthma, associated with fibroids and pelvic adhesions, was cured by galvanism. Pelvic examination showed lacerated perineum, cervix low down, and uterus fixed with plastic exudate. Two masses the size of a large orange were seemingly attached to the right cornu. Complete hysterectomy and ovariotomy had been advised by a leading New York gynecologist, and refused by the patient. On account of the great tenderness vaginal abdominal alternations were used, a large pad of absorbent cotton and wire being placed over the abdomen and a Le Clanche zinc electrode with rubber tubing and the tip covered with cotton, in the vagina. Gradually turning the current on and off and reversing it occasionally, from 25 to 100 milliamperes were used, the patient being able to bear more some days than others. Treatments were given at first on alternate days and later twice a week. In six months the exudate was absorbed and in one year the pelvic organs were nearly normal, the fibroids being reduced to the size of a walnut. As the pelvis cleared the asthma became less, finally ceasing also. One year ago (four years after the conclusion of the treatment) she gave birth normally to a nine-pound boy. The interesting points are (1) that the asthma was of reflex origin and ceased as the pelvic condition was relieved. (2) The uterus, which the leading gynecologist of central New York said it was necessary to remove in order to save the patient's life, under electrical treatment produced four years later a healthy child.

4. Cataphoresis is a subject of general interest to the members of our profession, and this article is intended specially to illustrate its usefulness in producing local anaesthesia.

Local anaesthesia is very desirable when we desire anaesthesia in surgical operations, and when we desire to relieve pain and it is deemed unwise to risk giving a general anaes-

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thetic; or when we have localized pains of sufficient intensity to demand the use of anodynes for its relief.

In the first class are minor surgical operations such as opening abscesses, carbuncles, felons, etc. In the second class are found severe localized pains, especially neuralgia and localized muscular spasms.

Cocaine has been extensively employed, but requires the insertion of its solution hypodermically under the skin of the part affected.

The objections to this method are: (1) The painfulness of the insertion of the needle; (2) the dangerous and disagreeable constitutional symptoms produced by the drug; (3) the danger of formation of the drug habit; (4) the limited area of the body that can be thus anaesthetized.

Cocaine used by cataphoric action is the ideal anaesthetic, and requires no complicated apparatus nor expensive appliances.

Its advantages are: (1) Complete anaesthesia without giving pain in its application; (2) no danger from its constitutional effects; (3) no formation of drug habit; (4) a large area of the body may be anaesthetized, with no dangerous effects.

Dr. Gill has seen two deaths which occurred during general anaesthesia.

6. This report was presented at the annual convention of the A. E.-T. A. in September, 1903, and cannot well be abstracted. Copies may be had from Mr. W. J. Jenks, 120 Broadway, New York, chairman of the committee.

ARCHIVES OF THE ROENTGEN RAY.

London, Eng., May, 1904.

1. Lectures to Medical Practitioners on Physics Applied to Medicine. Lecture 3, by Sir Oliver Lodge.
2. Note on the X-Ray Treatment of Malignant Growth, by C. Thurston Holland.
3. A new and Simple Phototherapeutic Lamp, by H. G. Piffard.

1. The localization of foreign bodies is valuable as the locality can be determined with absolute accuracy. There are several localization devices, and with each the method is triangulation. The apparatus is so constructed that the calcula-

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tion can be quickly and accurately made. The Mackenzie-Davidson cross-thread localizer, or a modification of it, is the one mostly used. This necessitates two pictures being taken from two different radiant points in a known position relative to the cross; it is best to take them on separate plates and then transfer the impression to one sheet, but it is possible to take them both on the same plate. In practice, it is necessary to have a couch or table on which the patient lies, and on the table to have two cross wires which will throw a shadow of the cross on the plate. The wires are often smeared with ink, and this marks the position of the cross wires on the skin. The tube is arranged above the center of the cross so that the radiant point is perpendicular to the photographic plate. The distance between the target and the plate is carefully measured and then shift the tube a known distance to the right and from this position take the first picture, and then shift the tube the same distance to the left of the median line and make the second exposure. Now you have the cross of the photograph; the cross on the patient; a shadow thrown by the radiant point in one position at a known height; another shadow thrown from the second position with a known displacement; and from this data the exact position of the foreign body can be learned. This is most conveniently calculated by cross threads with the plate in the position on the table and with a marker to indicate the different positions of the tubes when the two exposures were made. The thread is stretched from the point which indicates the position of the target of the tube (in the first position) to the foreign body in the first picture, and another thread from the target of the tube in the second position to the foreign body in the second picture. The point where these threads cross marks the position of the foreign body in the tissues. If two different plates have been used, then you must use transparent paper and take an impression from the photographic plates; the calculations are figured out the same, using the paper instead of the radiograph.

2. Holland considers that the high frequency currents are not as effective in the treatment of malignant disease as the X-Ray, but considers the latter to be most unreliable as far as

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prognosis in any given case is concerned. Some cases that appear to be good cases for the X-Ray are made worse by it and vice versa. He considers the personal equation of the operator a most important factor in the determination of the quality of both radiotherapeutic and radiographic results. He does not believe that the application of the X-Ray is capable of causing metastasis of the original growth. Rodent ulcer responds best under X-Ray treatment, next to this epitheliomas upon the surface, and thirdly, any malignant disease affecting or closely underlying the skin, in which class he includes cancer of the breast. In the deeply seated growths he does not consider that the X-Ray is of very much use, but believes that as the only chance it should be applied and that life may be prolonged, pain relieved, foul ulceration made healthy, and the patient more comfortable by its use. The outlook as to future development in this field is considered as more or less hopeful. Those who decline operation altogether should be given X-Ray treatment, and probably the agent should be applied after operation in those who consent to this procedure. A case is reported of recurrent cancer of the breast in which considerable benefit has been secured. In reference thereto, he says, "She came to see me last April, a broken-down, cachectic, weak woman, with a foul, stinking ulcer and every appearance of rapidly going down hill. It looked hopeless.

"She rapidly improved under treatment from the first, both locally and generally, putting on weight, gaining strength, and losing her anaemia. The ulcer healed, the whole local trouble disappeared, and no new areas of growth appeared.

"She was so well that she was able to go to London to visit relatives for Christmas and be away for six weeks.

"The disappointment appears to lie in the enlargement of the glands. It looks ominous; but even if eventually these glands should prove to be malignant, still, I think the treatment has been fully justified."

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Society Meetings.

MINUTES OF THE MAY MEETING OF THE CHICAGO ELECTRO MEDICAL SOCIETY.

The meeting was called to order by the President Dr. Burdick.

The minutes of the preceding meeting were read and approved.

A paper was then read by Dr. C. S. Neiswanger on "The Value of Various Currents for Therapeutic Purposes."

The paper was discussed by Drs. Rice, Coleman, Lave, Burdick and Mr. Treadwell.

The Society then adjourned.

MINUTES OF THE JUNE MEETING OF THE CHICAGO ELECTRO MEDICAL SOCIETY.

The society was called to order by the president.

The minutes of the preceding meeting were read and approved.

It was moved and seconded that when the Society adjourns, its next meeting will be on the last Tuesday in September. Carried.

A paper was then read by K. G. Frank, Ph. D., entitled "The Working of the Oudin Resonator and Phenomena Exhibited Therewith." The paper was dicussed by Dr. Burdick and Mr. Treadwell.

The Society then adjourned.

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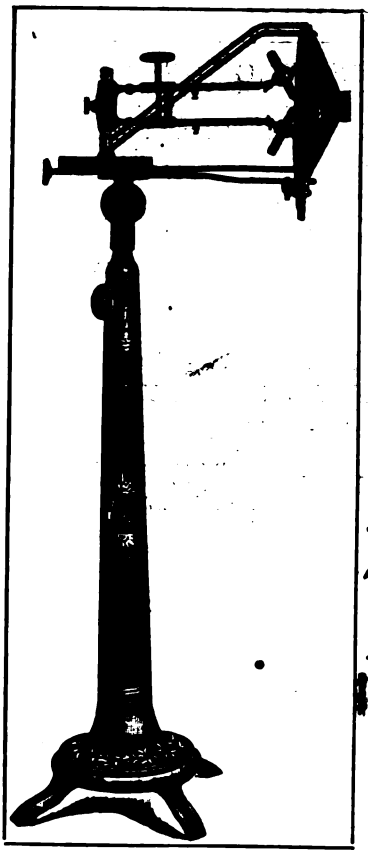
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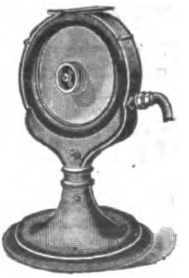
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Archives of Electrology and Radiology

Vol. IV August, 1904 No. 8

Original Contributions.

INSTANTANEOUS SKIAGRAPHY OF THE THORACIC ORGANS.*

Mihran K. Kassabian,
of Philadelphia, Penn.
Director of the Roentgen Ray Laboratory of the Philadelphia Hospital, etc.

We are all acquainted with the fact that it is by no means an easy matter to produce absolutely perfect skiagrams of the thoracic organs. Especially has this difficulty shown itself in former years, when, in order to produce a skiagram, it was necessary to prolong the exposure, resulting in a more or less defective skiagram, entirely due to the cardiac and respiratory movements. With the production of improved X-Ray apparatus we are now in a position where the time of exposure has been lessened from one to four minutes to as many seconds, and even less, with a distinct improvement in the resulting picture.

The production of such skiagrams independently of the cardiac and respiratory movements, depends directly upon two things; first, upon the employment of an outfit that is as nearly perfect in its construction as possible, and secondly, upon a technique that has been proven to be undoubtedly correct as a result of a long series of experiments. Therefore, to overcome the defects in skiagrams due to the movements of respiration, it is necessary to expose the part and plate to the action of the X-Ray but momentarily, and this at the end of inspiration. In the case of the heart, however, the exposure must obviously be practically instantaneous, or synchronous with a part of the cardiac cycle.

I shall now briefly consider the apparatus which I employ for this purpose and which I have found especially useful to determine the outline and condition of the organs in the thoracic cavity.

*Read at the Fourth Annual Meeting of the American Roentgen Ray Society at Philadelphia, Penn., December 9th, 1903.

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(a) Ruhmkorff Coil.—This, of course, is the most important part of an X-Ray equipment and without it our endeavors, as far as thoracic work is concerned, would only be rewarded with fruitless results. Some authorities claim that a static machine would do as much in these procedures as the coil but I cannot agree with these statements, as the result of careful experiments made with both apparatus, disprove them. The coil to be employed for the production of the very best skiagrams should be of twenty-inch spark producing capacity, as the size and construction of the coil are important factors.

(b) The next part of the apparatus, and without which a coil would be useless, is the interrupter. Of this appliance there are a large number of different patterns on the market. During the past seven years I have tried nearly all of them, arriving at the conclusion that the electrolytic alone is the interrupter which gives satisfactory results in rapid thoracic skiagraphy. Rapid vibrations are an absolute necessity, hence a rapid "Make" and "Break" are necessary. As the electrolytic interrupter causes a rapid "Make" and "Break" (from 8,000 to 16,000 interruptions per minute) it exactly satisfies the needs in skiagraphing the heart and lungs. If the interruptions per second are known, by increasing the number the "Make" is lengthened in time and frequency and the result is an increased discharge from the secondary coil. The excitation of the tube and penetrability of the rays depend upon the "Make" and the number of vibrations of the interrupter—if they be increased the efficiency of a tube and the emanating ray will likewise be improved. From the above it may be inferred that a mechanical interrupter would be unsuitable. The number of interruptions (from 650 to 900 per minute) being by far too few in number to employ with any degree of satisfaction in rapid thoracic skiagraphy. Furthermore, the amperage in the case of the electrolytic interrupter is greater than in the mechanical one.

(c) Crookes Tube.—For quick exposure work a tube with a very high degree of vacuum should be used. This means that the power of penetration is also high, a fact which has been proven very essential in rapid skiagraphy of the thoracic organs. The degree of penetrability is best measured by means of the fluorescent screen-hand method or other similar skiametric devices.

(d) Intensifying Screen.—Many authorities highly recom-

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mend the employment of intensifying screens to accelerate the action of the rays upon the exposed plate. I have employed the screens very largely, and have come to the conclusion that they should only be used in those cases where the patient's safety demands the shortest possible exposure. Among the various procedures for accelerating and intensifying the action of the rays upon a sensitive plate, only one has thus far proven to be of any use at my hands, i. e., the approximation of a fluorescent substance to the vicinity of the sensitive plate. The action of the fluorescent material upon a sensitive plate is very much like ordinary light, in other words, the rays are enhanced in their effect by the fluorescence. In employing intensifying substances, it becomes necessary to bear in mind two factors, namely, the granularity of the fluorescing surface, which greatly reduces the definition of the resulting skiagram and almost effaces the details of the smaller osseous structures, and the necessity of either using color-sensitive (ortho chromatic) plates, or first color-sensitizing ordinary plates, since the best screen (platino-cyanide of barium) fluoresces with a yellowish green light which does not greatly affect ordinary dry plates.

The resulting skiagrams present most excellent effects. The advantages of the tungstate of calcium screen are that the sensitive dry plate does not have to be first color-sensitized and that the cost is very much below platino-cyanide screens.

(e) Sensitive Plate.—Success in skiagraphing the thoracic organs depends also, to a great extent, upon the type or variety of sensitive plate employed by the skiagrapher. The sensitiveness or degree of rapidity with which a sensitized plate is affected by the X-Rays bears a close relation to the light sensitiveness under ordinary circumstances. In experiments which I performed several years ago I observed radiographic and photographic sensitiveness to be about equal up to 82° or 100° measured according to the scale of Driffield. Furthermore, in these experimental investigations I proved that a higher degree of sensitiveness to light had no corresponding parallelism so far as the sensitiveness to the Roentgen rays was concerned. In skiagraphing the thoracic organs it is essential to use a plate that is "extra rapid" as is manufactured by nearly all of the up-to-date plate makers. The plates which I used in the following experiments were doubly coated with the emulsion but only on one surface, this plate being better by far than the one ordinarily used in photography, or films.

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The technique of skiagraphy of the thorax is as important as the style of apparatus used, and this I shall next briefly consider. Without a proper technique the results of thoracic skiagraphy are practically fruitless.

(a) Position of Patient.—The patient may be placed in either the recumbent, semi-recumbent, sitting or standing position. In order to bring out the shadows of the lungs, heart and aorta clearly, the patient should be placed in the ventral-recumbent posture, with arms folded above and over the head. This posture serves to bring the above organs nearer to the plate, hence more distinct shadows are obtained than when the patient is placed in the dorsal-recumbent posture. In the former position, the shadows produced by the scapulae and vertebrae do not interfere with the shadows cast by the organs. The shadows in the illustrating skiagrams are narrowed down and placed along the edge on each side of the thoracic cavity. In shortened exposures the shadows of the vertebrae are practically obliterated or at least greatly diffused, and this faintly. It goes without saying that the plate is placed under the patient with X-Ray penetrating the thorax from above. I employ the dorsal-recumbent position when there is a consolidated area in the posterior portion of the lung, as may be first determined by means of the fluoroscope. This would serve to bring the diseased lung area nearer the sensitive plate than is the case if the patient were placed in the ventral-recumbent posture. Another instance where I recommend the dorsal-recumbent posture is in aneurysm of the aorta (of large size) and especially when there is associated extreme pain, which would prohibit the placing of the patient in the reverse position. In this case the tube should be placed under the table, the rays penetrating the thorax from its posterior aspect, with the plate placed above and in touch with the anterior chest wall. Care should be exercised to fasten the plate in such a manner as to prevent accident from moving the patient as may be the case with those afflicted with nervous disorders. Some authorities recommend the standing or sitting position—these I have never been able to successfully employ, because of the fact that the major number of cases under X-Ray examination are usually nervous and when a spark or slight noise is produced they will move, causing an unsatisfactory result.

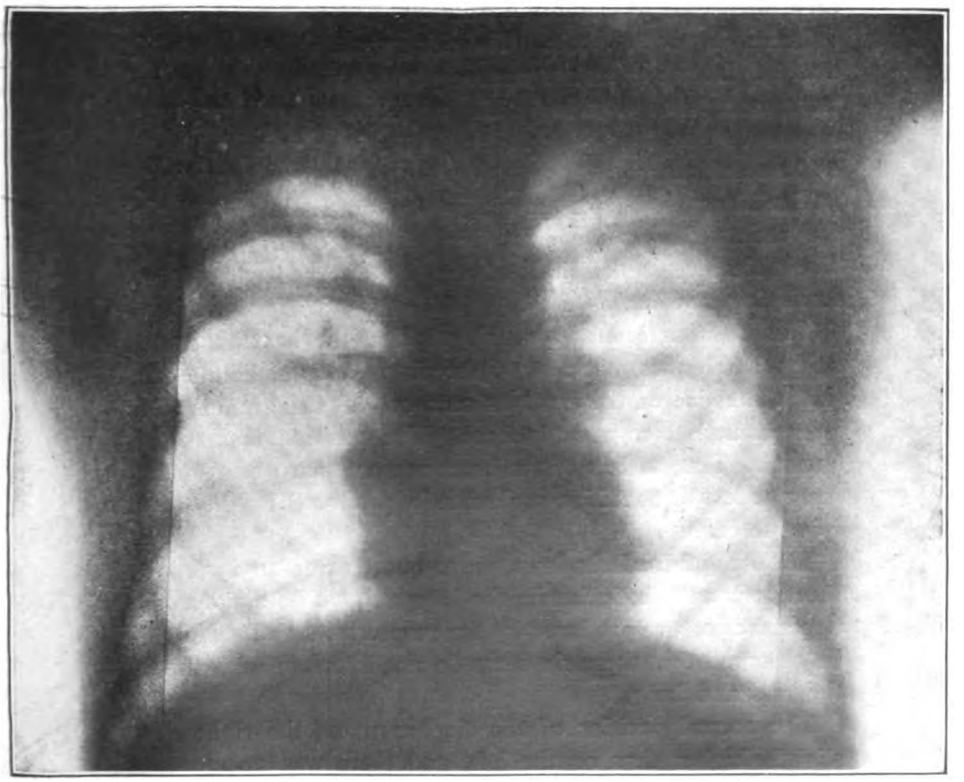
The exposure of the part to the action of the rays, in order to produce a satisfactory skiagram of the thoracic organs,

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should be made with the lungs filled with air—the patient having been previously instructed to hold his breath.

A series of experiments was conducted at the Philadelphia Hospital, with assistance of Dr. F. C. Johnson. The technique employed is explained in the subjoined cases.

Case 1. A young adult, 5 feet 5 inches in height, weighing 140 lbs., normal lungs and heart; all clothing was removed, pa-



Case 1.

tient lying prone with the arms folded over his head. A special photographic plate, 14 by 17 inches in size, and an intensifying screen (11 by 14) were placed under the thorax. A 15-inch Ruhmkorff coil, with an electrolytic interrupter was used.

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Current, 110 volts direct. Crookes tube was placed directly over the dorsal vertebrae, the anode forming an angle of about 20 degrees with the plate. The tube was distant from the plate about 22 inches; the amount of voltage to the primary coil during exposure could not be registered exactly (25-40 volts) due to the sudden switching on and off of the indicator; amperage about 20-25. The exposure was made while the patient had lungs deeply inflated by air during inspiration. The time of exposure varied between 1½ to 2½ seconds. Developed in Metol Hydroch. developer, came up slowly, continued this process about 25 to 30 minutes, negative has not been intensified in bichloride solution.

The Skiagram. No. 1. The skiagram exhibits, considering that the time of exposure was very short, a great deal of contrast, bones not showing well, on account of being underexposed. The lung, due to the contained air, appears to be emphysematous.

The blurred effect of the ribs is due to a sudden jumping of the patient during the switching off and on of the current. The difference in the shadows may be observed where the intensifying screen was used.

This position is best for skiagraphing the heart, the organ being thereby brought near to the plate, a matter highly essential. The size of the heart as seen on this skiagram is 16 cm. as measured from apex to base. The position is apparently normal. The borders of the heart are not sharp being blurred more or less, a condition undoubtedly produced by the intensifying screen.

The longitudinal shadows, three-quarters of an inch in the short axis and six inches in the long axis on both sides of the upper thorax, are produced by the respective scapulae. It may be observed that these shadows do not interfere with those of the ribs and lung.

The normal position of the diaphragm on the right side is slightly higher than on the left, and there was no movement of it as is normal during respiration. The upper margins, therefore, are clear cut and sharply defined.

The following table indicates the different experiments performed on the same individual, employing different positions, different interrupters and the use of the intensifying screen. The changing of the position has no apparent effect upon the skiagram, so far as time of exposure is concerned.

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POSITIONS OF PATIENT	No. of Experiments	Wehnelt	Mechanical Vibration 590 p. m.	Current to Primary Coil During Exposure: Volts	Current to Primary Coil During Exposure: Amperes	Crookes Tube: Distance of Anode From Plate: Cm.	Crookes Tube: Degree of Vacuum: Variety	Crookes Tube: Degree of Vacuum: High	Crookes Tube: Degree of Vacuum: Medium	Crookes Tube: Degree of Vacuum: Low	Intensifying Screen: With	Intensifying Screen: Without	Time of Exposure: Seconds	Results
I. PRONE	1		With	60	3 to 5	60	Self Regulating	H				Without	30 to 35	Good
II. DORSAL OR RECUMBENT	2		With	60	3 to 5	60	"	H			With		8 to 10	Good
III. SEMI-RECUMBENT	3	With		25 to 40	15 to 20	60	"	H				Without	2 to 4	Fair
IV. SITTING OR ERECT POSTURE	4	With		25 to 40	15 to 20	60	"	H			With		½ to 2	Fair

Patient, man 22 years old, 5 ft. 5 in., weight 140 lbs.

Apparatus, 15-in. spark producing Ruhmkorff coil, current 110 volts direct, 10-cell storage battery.

I am of the opinion that soon I will be able to register all the movements of the heart (cycle of diastole and systole), the lungs, the ribs, the excursion of the diaphragm, on a series of consecutive plates to be shown in rapid succession as in kinetoscopic pictures.

1831 Chestnut St., Professional Building, Philadelphia.



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A SIMPLE DEVICE TO AID X-RAY TECHNIQUE.

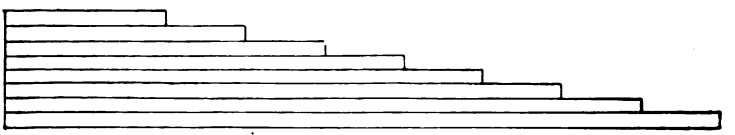
By O. Shephard Barnum, M. D.

Of Los Angeles, California.

The following suggestions are offered with the idea that it may be of interest to readers of this journal to know of a simple, home-made device which will materially assist in making the work of the operating room uniform.

The use of the hand or arm of the operator with a fluoroscope as a guide in estimating the penetrating power of the ray is greatly to be condemned, both as unscientific and dangerous. To do away with this habit I have for a long time used the following described simple gradient, which I have found highly satisfactory and efficient. The idea is not original but commends itself on account of its simplicity.

Ask any glazier to supply eight pieces of medium weight window glass cut 1½ in. wide, the shortest piece 2 in. long and the longest 9 in., the intervening ones varying 1 in. in length. Cut from a piece of sheet brass some small figures about ½ in. in height, from 1 to 8. Lay the pieces of glass in



No. 1.

regular order like accompanying cut (No. 1.) Place on the exposed part of the longest piece of glass the metal number 1, and so on up, the number representing the number of thicknesses of glass through which the ray penetrates. Bind them longitudinally by a strip of 1½ in. adhesive plaster; take a piece of 1 in. plaster and bind around each step, being careful not to lap. Over all paste a tough paper carefully and neatly, and the device is complete.

This gradient will tell instantly by the fluoroscope just what degree of penetration a tube has at any particular moment, and the variation in tubes can be measured by the distance of the gradient from the tube. In short, the metal number distinctly discerned at a certain number of feet from the tube will represent the penetrability of the ray from that particular tube.

With this device at hand, and a preliminary knowledge of

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the office equipment, viz., a familiarity with the characteristics of the various tubes, it is a simple matter indeed to duplicate any desired ray. It is wise to use one tube as a standard for comparison with all the others, and a few radiographs made with this gradient will determine their relation correctly enough to prevent serious errors in case of accidental loss of a tube, or other emergency. In using the rays for therapeutic purposes the more accurate we may be in their application, both as to abundance and penetrating power, the better our results will be. A change from one tube to another is in my estimation a much-to-be-regretted necessity unless the relation of those tubes may be determined, approximately at least.



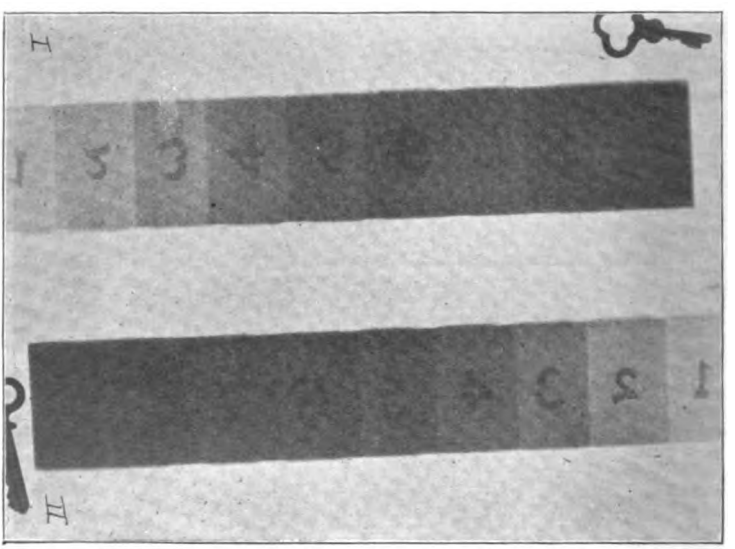
No. 2.

The left picture was taken with a tube of higher vacuum than the right picture. Note that this is shown not only by the shadows of the bones, but quantitatively by the penetration of the glass slips.

The accompanying cuts will give further insight into the value of this little device in everyday work. Cut No. 2 shows the difference between two tubes for radiographic work under exactly the same conditions, and on one plate, thus insuring equal development. These two halves of the one plate were made with different tubes under like conditions of distance, time and exciting power.

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Cut No. 3 represents the gradient skiagraphed by the same tube under exactly similar conditions with the exception of a difference in speed of interruptions by the mercury jet. The side marked I which is much more distinct for the higher numbers of the gradient, was made with the slower interruptions; side II being exceedingly rapid. This cut is presented only to show in an interesting way the fact which several operators have learned from experience—that the slower the interruptions in coil work, the better will be the results in radiographs. I have simply introduced a rheostat in the main circuit with motor on the interrupter, and am enabled in this way easily to control the number of interruptions for any particular work I wish.



No. 3.

Theupper picture was made with a slower speed of the interrupter, the lower picture with a higher speed.

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IS ELECTRO-THERAPY A FAD?*

By Otto Juettner, Ph. D., M. D., M. E.
of Cincinnati, Ohio.
Director of the Cincinnati Post-Graduate School of Physiological Therapeutics.

There can be no doubt that electro-therapy is at present and has been for a few years past attracting as much attention from the profession as any branch of medical practice. The interest seems to be spreading and has even communicated itself to the laity whose mind in this respect was prepared by the enormous importance of electricity in nearly every department of human activity. The discovery of Roentgen contributed a goodly share toward bringing electricity prominently before the eyes of an expectant public. Thus we have arrived at a state of affairs which is accomplishing many a change in our therapeutic reasoning and methods. The medical mind has been submerged, as it were, by an avalanche of electricity. The number of physicians who employ electricity is constantly increasing. Electrical machines are no longer an uncommon feature of the office equipment of even conservative general practitioners. It is not surprising to find many enthusiasts who are shooting beyond the mark by displaying an optimism which has a strongly marked morbid element mixed with it. Everything in sight is claimed for medical electricity. We are hardly given a chance to recover from the surprise of one extravagant claim before we are startled by something still more wonderful. Then there are those who cannot be made to believe that electricity is anything beyond a fad, a passing fancy. They deny that it has a place in medicine. Between the irrepressible enthusiast and the persistent skeptic it is difficult for the unitiated to come to any conclusion. To help in untangling this Gordian knot of contradictory statements and in defining if it is possible, the clinical indications and limitations of electro-therapy, I beg to present a few stray thoughts on the subject with a view of giving the uninitiated some tangible, incontrovertible facts concerning the clinical possibilities of electricity. If I succeed in interesting one or the other of those who decry electro-therapeutic methods, I shall consider my task well done. I shall confine myself to a consideration of electro-therapy properly so-called, to-wit; the uses of the continuous, the interrupted, the static and high-frequency currents in the treatment of diseased conditions.

*Read before the Homoeopathic State Medical Association of Kansas, May 4, 1904.

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The continuous current, usually called the galvanic current, possesses properties which are too apparent to be denied. The negative pole has an affinity for hydrogen and in this way effects dehydration of living tissues. This is equivalent to disintegration and destruction and, technically known as electrolysis, is a most valuable therapeutic agent in the hands of a physician. For the removal of warts, moles, naevi and all kinds of facial blemishes, there is no better method, the imperfect or bad results being almost invariably attributable to lack of skill and knowledge on the part of the operator and not to the method itself. In the management of urethral stricture a wonderful amount of good can be done by a skillful hand guiding the electrolytic urethral sound. In touching upon this subject it is but just to pay a befitting tribute to the life-work of Robert Newman who did so much for the elaboration of this important branch of bloodless surgery. The experience of all thoughtful and skilled operators bears out the claims which Newman made on behalf of the electrolytic treatment of urethral strictures. Closely allied to Newman's method is the electrolytic treatment of fibroid tumors of the uterus, originated by the lamented Apostoli and highly valued in suitable cases by all conservative gynecologists. In the treatment of goitre the use of the galvanic current has everything in its favor. There is hardly a case that cannot be benefited.

Mild galvanization is capable of affecting the functional power of nerve-trunks in a peculiar manner. The sedative action of the galvanic current is well shown by the manner in which spasmodic and irritable conditions of certain structures and organs are allayed by galvanization of the nerve supply of the affected parts. The application of a mild galvanic current to the vagus frequently relieves conditions of irritation in the parts and regions supplied by the vagus, especially the stomach. This is well shown in pregnant women suffering from gastric irritation of more or less severity. Most of these cases can be relieved by galvanization of the vagus. The anodyne action of the positive pole of a galvanic current is well marked and can be utilized clinically in a variety of ways. The pain of muscular rheumatism, for instance in cases of lumbago, pleurodynia, etc., can usually be relieved by an application of this kind. The action of a mild galvanic current on the nerve supply of the epigastric region is of cardinal virtue in cases of chronic dyspepsia, especially the atonic variety and supplements the stimulating effects of massage and

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vibration. The solar plexus responds to galvanic stimulation in a manner most striking as is shown by the sense of buoyancy which usually follows the application of the galvanic current to the epigastrium. The galvanic current has a distinctly reconstructive action. It counteracts degenerative and retrograde changes, it facilitates absorption and guards the integrity of normal tissue. This is exemplified by the good results which follow its use in the treatment of hypertrophic and hyperplastic changes in the uterine texture. Knowing its physiological potencies, the physician can find many uses for it in the treatment of well-nigh numberless diseases and diseased conditions.

The faradic current, while it is much less valuable than the continuous current, has a sphere of usefulness of its own, although hardly in proportion to its popularity. The buzz of the faradic battery is familiar alike to physician and patient. The interrupted or faradic current, acts upon contractile tissue of all kinds. It contracts muscular fibers and in this way **affects the arterial, venous and lymphatic circulation and conduces to the preservation of nerve-force in the structures acted upon.** It is the natural handmaid of massage and Swedish movements. It secondarily affects function in a manner similar to the action of galvanism on structures. It controls and equalizes the function of contractile tissue and in this way becomes a powerful therapeutic agent in the treatment of a variety of conditions in which primarily the muscular system or some portion of it, and secondarily the function of some related or contiguous structure, are at fault. This makes the faradic current an antispasmodic and an antineuralgic of value in suitable cases. In cases of muscular or nervous spasm, dysmenorrhea, etc., its therapeutic value cannot be gainsaid.

The static current seems to claim the lion's share of attention on the part of the general practitioner to-day. It has its ardent supporters and its equally fervent antagonists, while many physicians are not prepared to take sides with either of them. If the static machine were properly understood as a powerful therapeutic agent with a distinct sphere of usefulness of its own, the controversy would soon resolve itself into an intelligent discussion of an interesting and important clinical subject. Those of us who have given to static electricity a place in our therapeutic resources know with absolute certainty that characteristic physiological effects are obtainable by positive and negative static currents. There can be no

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doubt about the contractile action of positive currents of high voltage on the muscular coat of the arteries. The muscular fiber contracts, the vessel becomes smaller, the amount of arterial blood is lessened, intra-vascular pressure decreases, the process of nutrition (metabolism) is retarded. As a necessary result a sedative, anodyne effect is produced. On the other hand, we are likewise familiar with the stimulating, irritating action of a negative current resulting from dilation of the arteries, increase in the nutrition of the part and in the vascular pressure. We are familiar with the prompt antispasmodic effect of a static current in cases of asthma. No one doubts the tonic effect of static electricity especially on the nervous system. The so-called wave current is also a therapeutic quantity of no uncertain action. As a pain reliever it is as prompt as it is powerful.

I would hardly be doing justice to the subject of medical electricity if I were to ignore the importance of extremely high voltage in the treatment of disease. I refer to those currents, commonly included under the head of "high frequency" currents. No static machine is complete without its high-frequency coil, and the so-called vacuum electrodes. They are, probably without exception, the most powerful clinical weapons in the hands of the up-to-date dermatologist, and modern neurologist. The high-frequency current possesses a singularly alterative action on the skin and is capable of producing most remarkable results in chronic skin troubles, especially eczema. The neurologist utilizes the high-frequency current as a means of reaching the minutest structural and functional component parts of the nervous system. Every neuron, as it were, can be made to vibrate in harmony with the rapidly oscillating electric ions during a high-frequency application.

Other methods of utilizing high frequency are no less valuable. The solenoid and the diasolenic cylinder have long passed the experimental stage and have established themselves as therapeutic agents of great virtue.

Electro-therapy is by no means a fad. It has come to stay because it is capable of producing definite physiological results. This being the case, it is worthy of attention and study. In the hands of a thoughtful physician its value can hardly be over-estimated. Study it as you do your other branches of practical medicine and you will find yourself neither on the side of the electro-maniacs who claim everything in sight nor

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within the fold of the skeptics who condemn what they do not know. In practicing electro-therapy as well as any other branch of practical medicine, we should have an object in view, according to the old Roman adage: "Quidquid agis, prudenter agas et respice finem."*

*Whatever is useful it is prudent to employ and should be applied to the purpose."

Editorial.

ELECTRO-THERAPY AT THE WORLD'S FAIR.

St. Louis will present an unusually attractive aspect for those who are interested in electro- and radio-therapy, from the 8th to the 17th of September. The American Roentgen Ray Society will hold its annual meeting there, location of headquarters not yet decided upon, from the 8th to the 13th, omitting Sunday, the 12th; the American Electro-Therapeutic Association will be in annual session at the Inside Inn from the 13th to the 16th, and the International Electrical Congress will convene at the Coliseum, corner Olive and Thirteenth streets, from the 12th to the 17th. It is a rare event to have the annual meetings of so many important and practical scientific bodies held at the same place and time, and this unexcelled opportunity for getting into touch with all the latest developments along these lines will undoubtedly be taken advantage of by a great number of scientists. The scientific sessions of these bodies will be held only in the mornings whereby the afternoons can be utilized for visiting the various attractions of the Fair. The preliminary scientific programs of the American Electro-Therapeutic Association, the American Roentgen Ray Society, and the Electro-Therapeutical section of the International Electrical Congress, subject to revision and amplification, are as follows:

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

September 13, 14, 15 and 16.

President, A. D. Rockwell, M. D., of New York, N. Y.

"Some Observations on the Medical Uses of the Constant Current." Daniel Roberts Brower, of Chicago, Ill.

"The Therapeutic Application of the Continuous Current." Truman Abel Pease, of Norwood, N. Y.

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"Exhibition of a New Current Controller and Discussion of the Methods of Therapeutic Control of Street Main Currents." George Betton Massey, of Philadelphia, Pa.

"The Cataphoric Treatment of Cancer." Amedee Granger, of New Orleans, La.

"Clinical Reports of Some Interesting Cases Treated with Electricity." Samuel Fairweather Wilson, of Montreal, Canada.

"Clinical and Experimental Effects of Electrical Currents of High Potential and Frequency." John Holcomb Burch of Baldwinsville, N. Y.

"Therapeutic Action of High-Frequency Currents." Walter Henry White of Boston, Mass.

"Electro-Therapy of the Psychic and Sympathetic Neurone Centers." Charles H. Hughes, of St. Louis, Mo.

"The Physico-therapy of Neurasthenia." T. Riviere, of Paris, France.

"The Value of the Roentgen Ray in the Diagnosis of Fractures." Mihran Krikor Kassabian, of Philadelphia, Pa.

"Diagnosis of Calculi." Russell Herbert Boggs, of Pittsburg, Pa.

"Further Researches in the Treatment of Tuberculosis." Jefferson Demetrius Gibson, of Denver, Colo.

"A Case of Hyperidrosis of the Axillae Cured by the X-Ray." George H. Stover, of Denver, Colo.

"Violet Light Baths; Their Physiological and Therapeutic Effects." Ernest Albert-Weil, of Paris, France.

"The Use of the Ultra Violet Light in Therapeutics." Albert Eugene Sterne, of Indianapolis, Ind.

"Locomotor Ataxia Successfully Treated with Ultra Violet Rays." Joseph Monroe Liebermann, of New York, N. Y.

"Some Aspects of Phototherapy." Charles Rea Dickson, of Toronto, Canada.

"Phototherapy in Chronic Diseases." John Harvey Kellogg, of Battle Creek Mich.

"The Importance of Associating Other Physical Measures with Electricity in Therapeutics." William Benham Snow, of New York, N. Y.

AMERICAN ROENTGEN RAY SOCIETY.

September 8, 9, 10, 11 and 13.

President, J. B. Bullitt, M. D., of Louisville, Ky.

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TUBERCULOSIS.

"The X-Ray in Tuberculosis and Malignant Diseases." J. D. Gibson, M. D., Denver, Colo.

"The X-Ray in the Treatment of Pulmonary Tuberculosis." Emil Grubbe, M. D., Chicago, Ill.

"The Roentgen Ray in the Treatment of Tuberculosis." J. Rudis-Jicinsky, M. D., Cedar Rapids, Iowa.

"The X-Ray in Tubercular Adenitis." May Cushman Rice, M. D., Chicago, Ill.

CARCINOMA.

"Carcinoma of the Breast." Charles L. Leonard, M. D., Philadelphia.

"The Treatment of Epithelioma." G. C. Johnston, M. D., Pittsburg.

"Variations in Radiotherapeutic Technic." Russell H. Boggs, M. D., Pittsburg, Pa.

"Radiotherapeutic Nihilism." Gordon G. Burdick, M. D., Chicago, Ill.

"The Results of Treatment of Carcinoma by the X-Ray." J. N. Scott, M. D., Kansas City, Mo.

"The Roentgen Ray Treatment of Sarcoma." J. F. Smith, M. D., Chicago, Ill.

"Two Blunders and Their Lessons." Walter W. Johnson, M. D., Rochester, N. Y.

RADIOGRAPHY.

"An Improved Wehnelt Interrupter." Henry Hulst, M. D., Grand Rapids, Mich.

"The X-Ray in Injuries Near the Wrist." Martin Wilbert, Philadelphia.

"The Value of Stereoscopic Skiagraphy with Practical Demonstrations of the Process and Technic." Mihran Kassabian, M. D., Philadelphia, Pa.

"The Static Machine and the Radiograph." John Pitkin, M. D., Buffalo.

"Diagnosis of Brain Tumors and Softening." G. E. Pfhaler, M. D., Philadelphia, Pa.

"The Interpretation of Chest Negatives." P. M. Hickey, M. D., Detroit, Mich.

A paper by Weston A. Price, D. D. S., Cleveland, Ohio.

A paper by Levitt E. Custer, D. D. S., Dayton, Ohio.

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INTERNATIONAL ELECTRICAL CONGRESS.

(Electro-Therapeutical Section.)

September 12, 13, 14, 15, 16 and 17.

Chairman, W. J. Morton, M. D., of New York, N. Y.

FOREIGN.

"Radiology in the Pathology of the Brain." Prof. M. Benedict.

———— Dr. J. Bergonie.

"Some Improvements in Generator Apparatus of High-Frequency Currents." M. le Docteur G. O'Farrill.

"The Ionic Theory as Biological Basis for the Therapeutic Action of Electricity." Prof. S. Schatzky.

"Experimental Researches in the Treatment of Tuberculosis by Constant Current." Prof. S. Schatzky.

"Physico-Therapy of Neurasthenia." Dr. J. Riviere.

AMERICAN.

"Recent Advances in Roentgen Ray Science." Dr. Carl Beck, of New York, N. Y.

"Radiations in Therapeutics." By G. G. Burdick, of Chicago, Ill.

"The Nature of the Changes Established in Living Tissue by the Action of Oxidizable Metals at the Anode." Dr. Margaret A. Cleaves, of New York, N. Y.

"Some Observations upon the Treatment of Lupus Vulgaris by Phototherapy, Radiotherapy, and Otherwise." Dr. Charles R. Dickson, of Toronto, Canada.

"X-Rays and Radio-Active Substances as Therapeutic Agents." Dr. Emil H. Grubbe, of Chicago, Ill.

"The Principles of Electro-Therapeutics." Dr. T. Proctor Hall, of Chicago, Ill.

"Electro-Therapeutics." Dr. J. H. Kellogg, of Battle Creek, Mich.

"The Control of Life Phenomena by Electrolytes." Prof. Jacques Loeb, of Chicago, Ill.

"The Purification of Water for Drinking by Electricity." Dr. John Williams Langley, of Cleveland, Ohio.

"The Cataphoric Diffusion of Metallic Ions in the Destructive Sterilization of Cancer and Tuberculous Deposits.' Dr. G. Betton Massey, of Philadelphia, Pa.

"Artificial Fluorescence of the Human Organism as a Means of Treating Disease." Dr. W. J. Morton, of New York, N. Y.

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"Static Electricity in Chronic Nephritis." Dr. C. S. Neiswanger, of Chicago, Ill.

"A Large Fibro-Sarcoma Treated by X-Radiance." Dr. Clarence E. Skinner, of New Haven, Conn.

"Static Electricity in Therapeutics." Dr. William Benham Snow, of New York, N. Y.

As will be seen the fields of medical electrology and radiology will be very thoroughly covered and it is probable that greater results in the advancement of electrical science will accrue than from any other occasion of the sort so far held.

Miscellaneous Abstracts.

METHOD OF STUDYING THE PATHOLOGY OF BONE LESIONS BY THE X-RAYS.

Henry O. Feiss, Jour. Med. Research, Boston, May 1901.

The studies detailed by this article demonstrate that the extent and outline of a cavity in bone are by no means necessarily accurately indicated by the X-Ray, because the density of the shadow visible in the skiagraph is dependent upon the degree of density of the bony tissue surrounding the cavity and which may be increased by disease to such an extent as to obliterate some portions of the cavity altogether. A skiagraph was taken of the os calcis of a child, which was suspected of being diseased, and a small cavity was indicated upon the skiagraph just anterior to the middle of the bone, with an increase in the density of the shadow in the middle portion of the bone. The bone was removed and found to be diseased and the cavity was found to extend over the area in which the shadow in the skiagraph was even denser than in the normal portion of the bone. The bone was then split and skiagraphed again with the split side upon the plate and practically the same conditions were found to obtain. A slice was then taken off from the split surface and skiagraphed again, and portions of the bone from the region of densest shadow and another from the region of slight shadow, both being taken, however, from the sharply defined edges of the cavity, were prepared for histological examination. The section from the region of dense shadow showed an actual thickening of the bone trabeculae, whereas the section taken from the region of slight shadow, although the edge of the cavity was just as sharply defined here as elsewhere, showed that the trabeculae were

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much thinner than in the other regions. The conclusion is that a cavity in bone shows in a skiagraph, not because it is a cavity, but on account of the actual thickening of the bony trabeculae in the neighborhood of the periphery, and that if the disease process has not produced such thickening the outlines of the cavity will not necessarily be visible; also if this thickening has extended to that region of the periphery between the X-Ray plate and the source of X-Rays, the cavity may be rendered entirely invisible as far as X-Rays are concerned, by such thickening. Caution, therefore, must be exercised in the interpretation of skiagraphs as regards the outlines of a cavity indicated thereon, and if the cavity does not show, its non-existence cannot thereby be considered as demonstrated. In the os calcis specimen referred to above, the region of the densest shadow in the skiagraph of the gross specimen was directly over one portion of the cavity, and was due to great thickening of the bone trabeculae in that portion of the periphery which was between the source of the rays and the photographic plate.

FURTHER OBSERVATIONS OF THE THERAPEUTIC VALUE OF RADIUM AND THORIUM.

J. M. H. McLeod, British Med. Jour., June 11, 1904.

McLeod has treated the following cases with five milligrams of radium, radio-activity 600,000 to 1,500,000, in sealed glass tubes which were applied directly to the pathological tissues. Exposures were made with the strongest specimens for ten minutes and with the weakest specimens for an hour. Over-exposure in several instances caused sluggish ulcers which required weeks to heal. One case of lupus verrucosus, area affected about three inches by one and one-half, which was cured in four months with forty-eight treatments. Two cases of lupus vulgaris, one the size of a sixpence and the other the size of half a crown; the first entirely disappeared in five months with eighteen exposures, the second has had seventy exposures and is greatly improved but not cured. Two cases of rodent ulcer, one the size of a sixpence and the other probably twice as large; the first was cured with eighteen exposures and the second with forty-six. Two cases of inoperable carcinoma of the cervix uteri in the first of which no effect was produced; the second patient discontinued treatment prematurely, and after some benefit upon the malignant mass appeared to have been secured. Other cases of rodent ulcer, superficial epithelioma, lupus erythematosus, lupus vulgaris

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and vascular naevus were treated without any benefit. He considers that with lupus involving the mucus membrane of the nares, radium promises to be of great use, as it is almost impossible to get either the X-Ray or the Finsen light upon pathological areas so situated. He appears to consider that radium offers no advantage over X-radiation except in small lesions where the application of radium is much simpler than the X-ray, and when cavities inaccessible to the X-Ray are to be treated. The conclusions which he forms from his experience with radium are as follows:

"Its chief utility is in the treatment of rodent ulcer, and in the case of small rodent ulcers it acts almost like a charm. In rodent ulcers of a diameter larger than that of a shilling treatment by the X-Rays is more practical, as the whole of the ulcer can generally be exposed at once and not piecemeal as with the small quantities of radium at present at our disposal. In some cases of rodent ulcer, however, which have been subjected to a long series of exposures to the X-Rays, the rays seem to lose their effect and the healing process becomes stationary; then exposure to radium may be used with advantage and the healing again stimulated. With regard to epithelioma my experience is disappointing, but it is insufficient to base any definite conclusion upon. I am inclined to regard it of little value and to urge again the necessity of immediate excision and the postponement of treatment by the various radiations till after operation. In the case of cancer of the uterus further experience is necessary before any definite statement can be made; it is possible that the radium may prove a useful adjunct to the surgical treatment.

"In lupus vulgaris radium causes the disappearance of the granuloma and a replacement of it by healthy scar tissue, but except in very small lesions this treatment is not at present practical. It is a useful adjuvant to the Finsen light and X-Rays, however, as it can be applied to positions which are difficult to get at, such as about the eyelids and the mucous membrane of the nose. In the verrucose type of lupus vulgaris, however, it is superior to the Finsen light.

"In lupus erythematosus its value seems to be negligible."

He has tried the effect of binding one-quarter of a pound of thorium hydroxide in a rubber bag upon two cases of lupus vulgaris every night for a month. Absolutely no effect was produced and no indications of any inflammatory reaction. The absence of therapeutic effect was not due to the thorium being

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enclosed in rubber as was proven by the fact that at one time one of the bags began to leak and in the mornings the area would be found dusted over with thorium.

FOREIGN BODIES IN THE EYE AND THEIR REMOVAL WITH THE ELECTRO-MAGNET.

W. B. Marple, Medical Record, June 25, 1904.

The giant electro-magnet is useful in diagnosing the presence of a piece of steel or iron in the eye, and in removing it. For the attainment of the first object the magnet should be gradually brought close to the eye when the patient will feel pain if such a body is present, due to the "pulling" of the magnet upon it, unless it is located in an insensitive part of the eye. Even if such is the case the diagnosis by the magnet can sometimes be made because of the bulging of a portion of the globe produced by the effort of the iron to get to the magnet. In those cases where the foreign body is so located that the attraction of the magnet will not produce pain or bulging, or when the body is of such a nature (copper or glass) that the magnet does not attract it, the X-Ray will usually give reliable information as to whether it is present, and where it is. In ten such cases Marple secured reliable and satisfactory results with the X-Ray in every one.

In removing the foreign body if it is iron or steel, the magnet may be used in two ways; first, by making an incision into the interior of the eye and inserting therein the small sound-like tip of the ordinary magnet, which is then carried as close to the particle as possible which then adheres and is drawn out with the magnet, or by using the giant magnet at a distance to first draw the particle into the anterior chamber when it may be removed through the wound of entrance, or through a small incision into the anterior chamber which is best made at its periphery.

Enucleation, which was frequently the only resource in former times, can usually be avoided by the skillful use of the giant magnet.

ROENTGEN RAY TREATMENT OF LEUKEMIA.

Lawrence C. Grosh and Willard J. Stone, Journal of the American Medical Association, July 2, 1904.

This article is a report of a case of myelogenous leukemia and is particularly valuable because of the fullness and minuteness with which the observations were carried out and detailed. The patient was a male, aged forty-four years and

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first came under observation in June, 1903. The axillary glands were enlarged to the size of a filbert, spleen enormously enlarged, of firm consistency and exhibited a notched edge, extended from about the seventh rib, mid-axillary line to the navel on the right and nearly to the symphysis pubis. Pulse 84, irregular, low tension, small and dicrotic, temperature 101° F. Blood count showed 2,100,000 red cells and 960,000 white cells; color index 1.0+, many myelocytes, normoblasts and basophiles were present. Patient was passing from 3,500-4,000 cc. of urine daily, specific gravity 1,018 to 1,020, no serum-albumin was detected. From June 1903, to February 1904, the patient was treated with arsenic and mercury. The white corpuscles steadily decreased under this treatment until December when they reached 135,000. The number then began to increase again until February, at which time the whites were 266,250, and the reds 2,464,000. The patient was growing worse. February 24, 1904, X-Ray applications were begun and were applied from a medium hard tube at a distance of from six to eight inches (whether this distance refers to the anode or the glass wall of the tube is not stated), for five minutes each, over sternum, spleen and epiphyseal junctions of the large bones every day. While the treatment was being administered the patient was receiving three times daily the following:

Ac. hydrochlor, dil.	.60
Tr. ferri chlor.	.60
Hydrarg. chlor. corros.	.0016
Ac. arsenosi	.0016
Syr. zingiberis	4.
Glycerini	4.

Between February 24 and March 20 the patient had received twenty treatments, and radiations were then stopped because of an extensive erythema. The leukocyte count on March 22, or twenty-six days after treatment was commenced, had reduced from 252,000 to 11,480, spleen was considerably smaller and harder than before treatment was commenced. Patient felt well and appetite had greatly improved. From this time until April 10, the X-Ray dermatitis developed until upon the latter date the entire chest and abdomen were raw. Leukocytes were 10,600, the spleen had continued to grow smaller. In a few days, however, the patient suddenly began to fail in strength and died from general asthenia. At the autopsy, the findings usually present in advanced myelogenous

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leukemia were noted. The spleen and liver were enlarged, cut with resistance, and presented a hard fibrous hyperplasia, but no leukemic tumors were found in these or any other organs. From their observations upon this case the reporters conclude "That the greatest good may be hoped for in those cases where the X-Ray applications are begun early in the course, before the hyperplasia of the cellular constituents of the bone marrow becomes a chronic process; and in the case of the parenchymatous organs, spleen, liver, before the resulting fibrous tissue proliferation has progressed so far as to perhaps seriously interfere with the functions of the organs in question.

"Since George Dock and others have stated that it is only seldom that a reduction in leukocytes is seen to below 50,000 c. mm. under arsenic and similar medication, it would seem that from the few cases so far reported, if leukocytic reduction is to be considered an evidence of improvement, the Roentgen rays certainly exert a powerful influence in that direction."

X-RAY THERAPEUTICS.

G. H. Stover, N. Y. Med. Jour. and Phil. Med. Journal., July 2, 1904.

Fifty-one cases of various diseases are reported including 6 of superficial cancer of which 3 were cured, 3 were greatly benefited; 6 of the lip, of which 4 were cured, 1 temporarily benefited and 1 greatly benefited; 8 of deeply located cancer, of which 1 involving the mediastinal glands was cured, 1 was slightly benefited, 4 were temporarily benefited, and 2 were not benefited at all; 3 of carcinoma of the breast, 1 of which was cured, and 2 were improved; 1 involving bony tissue which was benefited; 5 cases of tuberculous glands and sinuses, 4 of which were greatly benefited, and 1 not benefited; 2 cases of tuberculous bone, both of which were cured; 4 cases of acne, 2 of which were cured, and 2 greatly benefited; 5 cases of Hodgkin's disease, 3 of which were greatly benefited, and 2 of which were not benefited; 5 cases of lupus of various sorts, 3 of which were cured, and 2 were benefited; 1 case of exuberant granulations which were destroyed with 3 applications; and 1 case of furunculosis of the neck, not dependent upon diabetes, which was cured.

Stover considers that lupus erythematosus is more slowly benefited by the X-Rays than any other form of lupus. He considers the X-Ray a specific for epithelioma and that the reason that results in deeply located carcinoma are not more

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gratifying may be that usually these cases are so far advanced when they come under treatment, but considers that the X-Ray offers many promises for the relief of these cases in the future. In cancer of the breast and other deeply located malignant growths he recommends initial extirpation with applications of the X-Ray before and after. Bone and glandular tuberculosis are considered a promising field for radiotherapy, but in tuberculosis of the lungs he is not so hopeful.

Details of technique, apparatus, etc., are not given.

THE RESULTS OF X-RAY TREATMENT.

Samuel Beresford Childs, N. Y. Med. Jour. and Phil. Med. Jour., July 2, 1904.

Fifty-one cases of various diseases that have been under the care of the writer are reported. From his observation of this series of cases he draws the following conclusions:

"First. The therapeutic field of greatest usefulness of the X-Ray is with superficial epitheliomata, rodent ulcer, and lupus vulgaris, when the area involved is conspicuous, as on the face or neck, and when a cosmetic result is particularly to be desired.

"Second. Healing by the X-Ray leaves the smallest and least perceptible scar; for, when properly applied, it destroys only diseased tissue, and particularly commends itself for use in those localities where it is undesirable to sacrifice the surrounding tissues.

"Third. The X-Ray is very efficacious in many obstinate cases, which have resisted the ordinary methods of treatment, such as acne rosacea, chronic localized patches of eczema and psoriasis, lupus erythematosus and kindred skin diseases.

Fourth. The results in tuberculous glands, when no suppurating focus is present, are encouraging, and the enlarged masses of glands in Hodgkin's disease appear to be susceptible to the treatment.

"Fifth. The X-Ray should not be employed in any operable, deep, malignant growth, with two exceptions: First, as pointed out by Coley, where a surgical operation would sacrifice an extremity, and even in this case the value of the X-Ray is uncertain, and is determined by a few weeks' trial. Second, as mentioned by Pusey, with a view to limiting the operation by checking the growth, when immediate operation is inadvisable.

"Sixth. The X-Ray may be of service even in inoperable malignant growths, by relieving pain, diminishing discharges, and lessening their offensiveness, and in many cases life may

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be prolonged in comparative comfort for a considerable period of time. Furthermore, from these apparently hopeless cases a number of remarkable improvements and a few recoveries have been reported.

"Seventh: The X-Ray should be used as a prophylactic against return after all operations for the removal of deep malignant growths.

"Eighth. The area of exposure should be wide, and the intensity and quality of the rays should be adapted to each case."

RADIUM AND ITS THERAPEUTIC POSSIBILITIES.

William Allen Pusey, Jour. A. M. A., July 16, 1904.

The physical properties of radium and its effects upon living tissues and bacteria, both gross and microscopic, are described at length. A study of the available evidence as to its therapeutical application and the clinical results derivable therefrom, has led Pusey to conclude as follows:

"Radium produces effects upon the tissues closely analogous to if not identical with those produced by *x*-rays. The indications, accordingly, for its therapeutic uses are along the same lines as those for *x*-rays, viz., in certain inflammatory diseases of the skin, like eczema, psoriasis, lupus erythematosus and lichen planus. In certain bacterial diseases of the skin, like acne, sycosis, lupus vulgaris and blastomycosis. In certain diseases where we wish to cause destruction of tissues of low resistance, as in lupus vulgaris, carcinoma and sarcoma.

"These are exactly the indications for the therapeutic use of *x*-rays, and future experience alone can determine which of the two agents will prove of the greater practical value in meeting these indications. In some respects I believe radium will prove superior; in the far greater number it seems to me that *x*-rays will have the larger field of usefulness. In the treatment of lupus and cutaneous carcinoma, we have sufficient experience to give us a fairly accurate technic in the use of radium. For its use in affections other than those which are sharply circumscribed to small areas, the technic has not yet been developed.

"It is probable that Becquerel rays will be efficient only to a very limited depth. This conclusion is based, first, on the fact that the greatest effect on the tissues is produced by the B rays, which have a relatively slight penetration, and, second, on the studies made by Halkin on the effect of radium on tissues. On account of lack of depth of effect it is not likely

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that radium will be as effective as *x*-rays against lesions of more than half an inch in thickness or subcutaneous in situation. Becquerel rays have theoretical advantages over *x*-rays in the accuracy of dosage which will be possible after we have obtained experience in their use. They also have advantages in their ease of application at inaccessible points. They have a disadvantage in the relatively small quantity of energy available, and in the limitation accordingly of any single efficient exposure to a very small area.

"It is highly improbable that the use of radium is going to be of epoch-making importance in therapeutics. It supplements and it may add materially to the methods now at our command for using actinic radiant energy in therapeutics. If it becomes less expensive and obtainable in relatively larger quantities, it may supplant to a limited extent the use of *x*-rays and ultra-violet light, although in my opinion this is not probable. At the present time it is not an entire substitute for either of them, and is to a very great degree less efficient than *x*-rays in its general therapeutic usefulness.

"Finally, the therapeutic possibilities of radium have, in my opinion, rather been overstated than understated in the foregoing estimate."

FLUORESCENT TRANSLUMINATION OF THE STOMACH.

Solomon Solis-Cohen, Am. Med. July 16, 1904.

By the use of his own modification of Lockwood's stomach lamp, which modification consists in using a firmer terminal for manipulation, Cohen gets good results in determining the position of the stomach by the use, in conjunction with the lamp, of fluorescent solutions in the stomach as suggested by Morton. He gives the patient two grains of bisulphate of quinine three times daily before the examination and makes up the fluorescent solutions some hours previous to use. Solution No. 1 consists of sodium bicarbonate in distilled water, two and one-half grains to the fluid ounce; solution No. 2 consists of solution No. 1 with the addition of two fluid drams of glycerin and one-quarter grain of fluorescin to the pint. Two or three minutes before the lamp is introduced into the stomach the patient is given one-half pint of each solution. Cohen considers that "To Einhorn, Morton and Kemp we are indebted for a simple, easily-applied, and very satisfactory method of wide application in clinical diagnosis."

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A CONTRIBUTION TO THE TREATMENT OF MALIGNANT NEOPLASMS BY ROENTGEN RAYS.

A. Hahn—Fortschritte auf dem Gebiete der Roentgen Strahlen, Vol. VII.

Hahn has treated 4 carcinomas of the mamma a recurrent carcinoma ventriculi, a carcinoma of the thyroid gland, a carcinoma of the esophagus, 3 rodent ulcers and a sarcoma of the axillary region. His conclusions are: "Pain wherever present was removed by Roentgen treatment. Otherwise the results are not brilliant; a reduction of the tumor in one case of cancer of the breast; a decided improvement, but no cure in two cases of cancer of the skin. The best result was seen in the case of sarcoma of the skin. The superficial nodules decreased rapidly in size. No new foci developed. Thus an effect of the Roentgen ray on malignant tumors in some cases cannot be denied, but there seems to be an effect only when the disease is in the skin. In deeper seated tissues an effect cannot be expected."

THE GENERAL AND LOCAL EFFECT OF ROENTGEN RAYS.

Dr. G. Baerman and Dr. P. Linser—Munchener Med. Wochenschrift, June 7, 1904.

The authors show by experiments that not the epithelum but the blood vessels are the part of the skin which is principally affected by X-radiation. The circulating blood itself undergoes no change, neither do the blood corpuscles or the serum.

Patients exposed to the Roentgen rays showed an increased excretion of nitrogen through the urine.

THE TREATMENT OF SKIN DISEASES BY MEANS OF ROENTGEN RAYS.

Dr. J. Mueller—Munchener Med. Wochenschrift, June 7, 1904.

I. Pruritus vulvae et anus cured after four radiations.

II. and III. Pruritus ani with secondary eczema, after three radiations the itching and the inflammatory alterations had disappeared.

IV. Hyperhidrosis manium excessiva. Tube distance 3 cm., treatment duration 3 minutes; cure after ten radiations.

IV. Hyperhidrosis regionis anales. Ten treatments, 10 cm. tube distance, 10 minutes treatment duration, reduced the perspiration to a minimum.

VI. and VII. Chronic eczema of both hands. Itching disappeared after one radiation, etc. The author used "medium soft" sometimes also soft tubes.

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Current Electrology and Radiology

(Only articles relating to the above-named subjects will be abstracted.)

JOURNAL OF ADVANCED THERAPEUTICS.

New York, July, 1904.

1. Electricity in the Treatment of Chronic Deafness, by George Z. Goodell.
2. A Year's Work in Electro-Therapeutics, by Laura V. Gustin-Mackie.
3. The Relation of Mechanical Vibration to the Nervous System, by Arnold Snow.
4. Report of the Committee on Current Classification and Nomenclature of the American Electro-Therapeutic Association.
5 Physical Modalities as Adjuvants in the Treatment of Tuberculosis, by J. D. Gibson

1. Goodell considers nonsuppurative otitis media only, giving an outline of the pathology. For the faradic current a conical electrode is used covered with wet chamois, the auricle first being filled with warm water. The other electrode is used on some other portion of the body. Poles may be used interchangeably. The continuous current is used in the same manner as the interrupted, the sittings not to be more than ten minutes long with a current limited to three milliamperes. Static is of doubtful benefit.

High Frequency.—The technique of this method of treatment consists in using the aural vacuum electrode for three or five minutes in the affected ears two or three times a week.

Ozone.—The ozone should be generated by means of an electric current on a Ruhmkorff's coil to which the ozonizing tube was attached. The ozone so generated is pumped into the middle ear through a Eustachian catheter for about three minutes.

Electrolysis.—This is used as a means of dilating strictures of the Eustachian tube. The method recommended is that of Bordier. The specialist should be provided with a graduated set of copper bougies ranging from three to six of the French scale, mounted on No. 5 or No. 6 copper wire. These are so fashioned as to fit into ordinary silver Eustachian catheters, which are insulated from tip to mouth. The bougie is to be pushed full length into the catheter until its copper tip protrudes slightly in the opening. The catheter is now introduced into the tube in the usual manner and carried along until the tip meets the obstruction. The wire is then attached to the cathode terminal of the current source and from two to five milliamperes is passed from two to five minutes. Bougies of gold of a length sufficient to allow protrusion for one and one-half inches or more beyond the tip of the catheter are also used. This arrangement permits the electrization of the entire

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canal at once. Better results are gained by the employment of weak currents.

Pneumatic Massage, etc.—Dr. Edward Pynchon of Chicago recommends pneumatic massage in middle ear troubles, the air pump being run by an electric motor. Dr. Grant has used with success in several cases mechanical vibration applied to the spine, the instrument consisting of a small motor, on the axle of which is placed eccentrically a brass disk. The instrument is pressed against the spine between the shoulders, and gives a series of slight jars which are probably transmitted to the bones of the middle ear.

The Acousticon is used as an aid to hearing to those quite deaf and even to deaf-mutes. The "Massacon" is designed to cause a normal tympanum to move through a maximum amplitude of vibration of one-thirty-second of an inch. The intention with this instrument is to so massage the ossicular chain as to have a tendency to restore it to its normal movements. Dr. S. H. Monell of New York advises the use of the earpiece of a telephone excited by his high-induction apparatus.

Although a great many methods, electrical and otherwise, have been suggested for the treatment of this disease, none have as yet been more than palliative. He reports several of his own cases, a number of which were considerably improved by the various forms of the electrical treatment.

2. Dr. Mackie has employed electrotherapy in 125 cases of various sorts during the past year. In neurasthenic conditions her results with the static modality have been very satisfactory and she considers that the use of static electricity is of value in the differential diagnosis of neurasthenia from the degenerative forms of insanity; neurasthenics are improved, the others are not.

As indicating the value of electricity in the treatment of some gynaecological conditions, a case is cited of a young woman, 24 years old, who was prostrated once a month by severe dysmenorrhea due to retroverted uterus and stenosis with endocervicitis. Dilation under ether was done which gave relief for a year. Dilatation with curettage was then done for return of symptoms which gave relief for three years. Symptoms then returned as badly as ever and Dr. Mackie treated her three times weekly for three months with the continuous current, effecting entire cure which has persisted to date, a period of ten years.

In treating uterine fibroids she does not use the heavy cur-

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rents ordinarily recommended having had very satisfactory results with much milder ones, strength not stated. In several instances patients had decided upon having the uterus removed after electrical treatment and Dr. Mackie was able to demonstrate that the use of the current had produced no adhesions or degeneration, notwithstanding much has been said to the contrary by those who oppose its use. She has also secured satisfactory results in the treatment of convalescents from acute disease, eczema, acne, herpes zoster, recent palsies, myalgias and considerable benefit in locomotor ataxia.

4. This report was presented at the annual meeting of the American Electro-Therapeutic Association, September, 1903, and cannot well be abstracted. Copies may be had from Mr. W. J. Jenks, 120 Broadway, New York, N. Y., chairman of the committee.

5. Of all known means of combating tuberculosis, so far, climate has been the most successful, and it therefore seems that the rational treatment is to follow in nature's footsteps and as much as possible intensify nature's methods. This can be accomplished by various physical means; viz., the X-Ray; ozone generated by the means of electric sparks; vibration and massage in all chronic forms of the disease, and superheated air or the electric arc light.

The electrical conditions of the atmosphere in Colorado seems to give a great deal of invigoration, influencing metabolism and nutrition generally. In some parts of the mountains there is sufficient high potential electricity to charge the body to such an extent that frictional sparks are observed when shaking hands.

The use of light and the X-Ray in tubercular skin diseases has been well demonstrated, and even much has been accomplished in deep seated conditions. At the meeting of the American Roentgen Ray Society at Chicago Dr. John B. Murphy called special attention to the influence and curative powers of the X-Ray upon tubercular diseases.

In 140 cases of tuberculosis treated by the X-Ray without a change of climate and reported by Drs. Burdick, Ransome, Boggs, Rudis-Jacinsky and Gibson there was a recovery of about 20 per cent, an improvement in about 70 per cent, with failures of about 10 per cent.

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LE RADIUM.

Paris, France, June, 1904.

1. Study of Atmospheric Electricity—Th. Moureaux.
2. Some Effects Caused by the Radiance of Radium on Living Organic Substances —Louis Matout.
3. Willemite—Louis Jecker.
4. Lecture by M. Becquerel at the Museum—Professor Becquerel.

1. At the present time the estimate of atmospheric electricity is generally made by means of the falling of a stream of water, flowing out through a long pipe which extends from a reservoir out into the open air. The rest of the apparatus consists of two batteries and a quadrant electrometer, carrying on its needle a vertical mirror which throws a ray of light on a scale contained in a dark chamber. Estimation of potential by this means presents many difficulties. The freezing of the water frequently interrupts the work in winter. Impurities of the water often contribute slight errors. The discovery of the salts of radium has removed all these difficulties. The writer has studied atmospheric potential with a new apparatus where radium takes the place of water, comparing the results with those obtained by the old method. A specimen of a radio-activity of 30,000 must be used but the description of the technique is not very definite. These observations prolonged for many days constantly gave curves similiar in every way to those given by the water method. The new method is constantly in regular service at the Observatory of Park St. Maur. Con- t ols repeated from one time to another permit the assurance that the results obtained preserve the same degree of precision as the old water method. The new procedure then possesses all the efficacy desirable, providing that the salt is endowed with a sufficient radio-activity and that it has been absolutely removed from the influence of humidity. This double condition having been realized, the apparatus proved itself singularly simple; the reservoir of water is abolished, and as a result the multiple inconveniences resulting from its employment. The advantages resulting from the new method are: constancy of elevation; total suppression of delays; diminution of expenses for apparatus and repairs; and extension of the method to the polar regions, where the study of these phenomena is particularly interesting.

2. In a study of the effects of radium on mustard seeds it was found that, after exposure to 2 mg. of radium of slight activity for a week or longer, their germinating property is entirely destroyed. With pure radium, he is certain that the

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same results would be obtained much earlier. It is the beta not the gamma rays that have an apparent action on germination. The gamma rays produce these effects indirectly, by means of secondary rays emitted by the absorbent body which they meet. The latter partake of the nature of beta rays emitted directly by radium. The effects of radium on the skin have been accidently discovered by carrying radium around in the pocket, especially when enclosed in a case of metallic lead, which is very productive of secondary rays. The ill effects are avoided by incasing in a second capsule of glass. No trace of chemical or mechanical alteration in these observations appears until some days after the exposure. It seems that the vital principle alone of the seeds has been suppressed.

3. Willemite, a silicate of zinc, frequently colored by the oxide of manganese and iron (troostite), is often crystallized in the form of hexagonal prisms. It is found in some zinc mines and more often in the form of small crystals in company with certain calamite minerals in the bed of Mt. Vieille. It also exists in a metamorphic rock in company with franklinite zincite, etc., in Franklin-Furnace, N. J. It is here that you actually meet the varieties most phosphorescent under the influence of radium. Here the willemite often exists in the form of great opaque crystals, often enclosed in the calcite accompanying the franklinite. More often it is encountered as resin-colored grains associated with crystals of black franklinite, red zincite, and white calcite. The structure of these minerals is that of massive rock resembling granite. Troostite is found in the same place in the form of small massive blocks; of a glossy resinous luster, and a hardness superior to glass. They are beautifully phosphorescent under the influence of radium, when struck with a hammer, or gently heated. Troostite is rarely pervaded by zinc, but sometimes with franklinite, more often with white calcite.

4. May 12th, Professor Becquerel delivered before a vast audience a lecture on radium and the radioactivity of matter. After a short history of the discovery of radium, he stated that radium presented two manifestations of energy—radiance and emanation. The radiance comprised the phenomena of luminescence and the liberation of heat. The rays were composed of three kinds, differing in their trajectories, and moving with the velocity of light. These radiations were absorbed by other bodies. Hence the gradual diminution of opacity of the glass radium containers and the new colorations produced in pre-

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cious stones. He next spoke of the effects of the rays on living cells, especially those involved in skin diseases. These phenomena seem to be due to the liberation of a sort of active vapor. M. W. Ramsey had discovered that the radium tube contained a very rare body, helium, evidently derived from the radium, which was very important, for it was the first example of the transmutation of elements which we have been able to obtain in chemistry. The phenomena of emanation must be compared to the emanation of odors. It is possible that these atoms of radium constitute primordial matter.

Book Reviews

ELEMENTS OF GENERAL RADIO-THERAPY.

By Dr. Leopold Freund, translated by G. H. Lancashire.

Published and for sale by the Rebman Co., 10 West 23d Street, corner Fifth Avenue, New York, N. Y. 597 pages. Price $5.00.

This work is a most valuable contribution to the literature of radiotherapy and is written by one who is thoroughly competent to treat the subject from the physiological, as well as the technical and clinical, standpoint. Part I treats of the physics, mechanics, and physiological actions of electricity, part II of the high frequency currents, part III of the instrumentation of and treatment with the X-Rays, part IV of the Becquerel rays, and part V of the treatment of disease with radiant heat and light rays. The book closes with a section of fifty-odd pages describing with great thoroughness different electrical and radiological apparatus.

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The treatment of Roentgen ray therapy is most satisfactory, and from the standpoint of one who has done a good deal of Roentgen ray therapy himself, it is reliable. It deals principally, however, with cutaneous lesions and not with the deeply seated disease processes. With regard to the latter, Freund very frankly states that he has "But little to contribute with regard to this particular department of Roentgen-therapy. He has seen practically no physiological or therapeutic effect which could be ascribed to the influence of the rays upon internal organs. Nevertheless, he is not prepared to state that there is no possibility of this effect. He believes that Kienböck goes too far when he says that X-Rays can only produce deep-lying change when an ulcer is first formed. There may be rays of another kind from the tube which influence tissues other than the skin." An interesting statement, in which he is in accord with many observers in this country, but which is vigorously denied by many operators both in this country and abroad, is that it is not necessary to produce a dermatitis in all cases in order to effect a cure of disease processes amenable to Roentgen ray therapy. He has produced many brilliant results without the induction of any dermatitis whatever. A large list of diseases is given in which Roentgen ray therapy is of value and each disease is treated at considerable length by itself as regards the therapeutic application of the rays thereto.

He believes that the X-Rays are the light elements derivable from the Crook's tube which are therapeutically active, and details experiments in which he excluded the other rays which appear to be conclusive in this regard. This is especially interesting in view of the fact that so many scientists are inclined to ascribe the therapeutic power of the light derivable from the Crook's tube to the cathode rays, electrical discharge, inductions, etc.

One of the most important and satisfactory features of the book is the systematic, logical and thorough manner in which the physiological actions of these therapeutic agents, both as regards modifications of tissue histology and function, are treated. Conclusions are not laid down as bare dicta, but the experimental researches by which he arrived at his conclusions are detailed in full. These details form a very valuable part of the work. It is as comprehensive and up to date as any work of the sort can be and should be in the hands of every one who is practicing or intends to practice any form of Radiotherapy.

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PRACTICAL ELECTRO-THERAPEUTICS.

By Franklin B. Gottschalk, M. D.

Professor of Diseases of Children at Jenner Medical College; Attending Physician German-American Hospital; Assistant to Chair of General Medicine, Chicago Policlinic; Member American Medical Association; Chicago Medical Society, etc.

Published by T. Eisele, Chicago.

This book, as its name implies, is a "Practical" and a *strictly practical* work of 325 pages on electro-therapy. It is a concise statement of the essentials of the subject, more especially as regards technique and physiological action, and of the facts involved as indicated by the author's experience. His ideas differ in some particulars from those of others who have written on these subjects but this is no more than would be expected when the subject treated is so vast and so inadequately explored as is electrotherapy.

It is divided into two parts: The first treats of the generation, physiological action, and application technique of the continuous, magnetic-induced, sinusoidal, static, and high frequency currents, and includes a section upon hydro-electric baths, and a brief chapter upon the X-Ray and the electric arc, incandescent, and blue light baths. This first part concludes with a section upon mechanical vibratory stimulation.

Part II. details the separate diseases in the treatment of which the author considers these different agents are valuable, and describes the technique of their application to the individual diseases and the most advantageous combinations. The chapter upon electro-diagnosis, a subject too often neglected in electro-therapeutical treatises, is particularly good and will prove very helpful to those in whose minds the subject is not clear.

The book contains numerous illustrations, and will be most helpful to the busy practitioner who has not the time to devote to a study of the more exhaustive treatises.



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RATIONAL HYDROTHERAPY.

A manual of the physiological and therapeutic effects of hydriatic procedures, and the technique of their application in the treatment of disease.

By J. H. Kellogg, M. D.

Member of the British Gynaecological Society; the International Periodical Congress of Gynaecology and Obstetrics; the British and American Associations for the Advancement of Science; the Societe d'Hygiene of France; the American Society of Microscopists; the American Medical Association; Superintendent of the Battle Creek (Mich.) Sanitarium; Author of the "Art of Massage," etc.

Second Edition. Published by F. A. Davis Company, Philadelphia.

The prominence which the elements of physical therapy are assuming in the management of disease processes to-day is well indicated by the appearance of this masterly and exhaustive treatise of nearly 1,200 pages. Every phase and aspect of hydrotherapy is thoroughly described and in a manner which satisfies the reader that logic, intelligent experiment, and extensive observation have been relied upon for the formation of the writer's conclusions, and astonishes him by the variety of conditions in which a good knowledge of hydriatic procedures and their rationale gives him a remedial control which is one of the most certain, if not the most certain, obtainable by the use of any therapeutic agent. At first sight one would be impressed with the thought that it was a book which would be valuable only to those connected with institutional work, but upon close acquaintance with its contents we find described and discussed the application of water in many ways that are entirely practicable in any grade of private practice and with beneficial results that are not attainable by any other means, in many pathological conditions with which the general practitioner is daily confronted. The indications for its employment, the technique of its application in different conditions and the results to be obtained together with the modifications of physiological function by which it produces its influences, are elucidated in a most satisfying manner, and we cannot but feel that the mortality and disability statistics which at present obtain in many acute and chronic diseases will be much changed for the better when hydrotherapy shall be understood and rationally applied by the general practitioner as well as the specialist.

Dr. Kellogg calls attention in the early pages of the work to a fact which simplifies the subject greatly, as far as comprehension is concerned, viz., that the influence of hydro-

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therapy is not due to the use of water, per se, but to the different temperatures for which the water acts as a carrier, and to the percussive mechanical properties inherent in the various manipulations of the agent involving force.

It is to be regretted in this connection that no consideration has been given to the modern therapeutical application of dry hot air. The hot air which Dr. Kellogg describes is applied by means of a cabinet in which the patient sits upon a stool, and is of a very low degree of intensity as compared with modern thermotherapeutical procedures. The effects of moderate degrees of heat are described very fully and carefully by Dr. Kellogg, but they are diametrically opposed in many respects to those of the high degrees of intensity and the reader will be misled if this fact is not borne in mind.

The book is divided into four parts; Part I. treats of the history of hydrotherapy; the physics of water, air, heat, and light in relation to hydrotherapy; anatomy and physiology in relation to hydrotherapy; the physiological effects of the external and internal application of water; the physiological effects of friction or mechanical irritation of the skin; and the physiological effects of light; part II. of the general principles of hydriatics; the therapeutic effects of hydriatic applications; general rules, principles, and suggestions relating to the practical employment of hydrotherapy; and the equipment of hydriatic institutions and the general management of cases; part III. gives a full description of the complete technique of every known hydrotherapeutic procedure; and part IV. treats of the different diseases in which hydrotherapy is valuable and the particular hydriatic procedure with the modifications of its technique demanded in the individual diseased condition.

We recommend this volume most heartily to every practitioner of medicine.

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Original Contributions.

DETECTION AND MEASUREMENT OF RADIO-ACTIVITY.

By George B. Pegram, Ph. D.,

of Columbia University, New York, N. Y.

As is well known now, the two most easily applied tests for the detection of radio-activity are that for the photographic action of the Becquerel rays and that for ionization of the air. The photographic test in which the substance is put near a dry-plate, with or without interposed screen, according to the demands of the case, and kept there a suitable length of time, has an advantage in that it requires no apparatus that is not at hand for anyone, but its application is very limited. Many causes besides the rays from radio-active substances are likely to produce slight effect on a sensitive plate, and a number of times erroneous conclusions have been arrived at and published by experimenters who were relying wholly on photographic action of the Becquerel rays. Furthermore, although each of the three types of rays does act on a dry-plate, the action of the easily absorbed alpha-rays, even when no screen is interposed, is very slight, yet the chief part of the radiation from the radio-active substances consists of alpha-rays, and from some of them, as polonium, of alpha-rays only; so if the photographic test were our only reliance, polonium would not have been discovered. For quantitative measurements the photographic test gives only very rough results. In one respect, however, the dry-plate has been of much use, namely, in getting the path of a beam of rays when deflected in a magnetic or electric field.

Electrical tests of the intensity of the radiation from a radio-active substance depends on the phenomena of ionization of a gas, such as air, by the Becquerel rays. In gases the conduction of electricity is of an electrolytic nature, the current flow consisting of the transfer of the positive ions from the anode to the cathode, and of negative ions in the opposite direction.

In a gas under normal conditions, however, only a very few of the molecules are broken up into ions, so that conduction is not appreciable until the gas is subjected to some ionizing agent, such as X-rays or the Becquerel rays from radio-active matter, which breaks up an appreciable number of molecules into ions, or, more briefly, *ionizes* the gas. The electrostatic stress between two electrodes in a gas will not ionize it, at least not until it becomes many hundred volts per centi-

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meter and a spark passes. In the case of the Becquerel rays, which we know are rapidly moving particles, it is easy to picture how the ionization comes about: As one of the little projectiles in its passage through a gas happens to strike a molecule of the gas it disrupts the ions of the molecule by the shock of its impact, while it loses some or all of its own kinetic energy. So far as is known, the amount of ionization is proportional to the number of Becquerel ray particles absorbed by the gas; that is, stopped by its molecules; as it is often put, ionization is proportional to absorption. The total ionizing energy of the rays will not be utilized in a gas unless the thickness of the gas is sufficient to absorb the rays completely.

If an ionized gas is left to itself the ions will meet one another occasionally and positive and negative recombine. The greater the number of ions present in a given volume, the greater the chance of a positive and a negative coming close enough to recombine; in fact, the number of recombinations varies as the square of the number of ions present. If there are electrodes in the ionized gas and a difference of potential is maintained between them, some of the ions are driven across to the electrodes before recombination occurs. When the gas is being continually ionized, as by the Becquerel rays, some of the ions recombine and some serve as carriers of the current between the electrodes; but if the difference of potential between the electrodes is great enough the ions will move to the electrodes so rapidly that practically all of them reach the electrodes before recombination occurs. In this case the maximum current that will go through the gas is attained, all the ions being used as carriers as fast as they are produced by impact of the Becquerel ray particles on the gas molecules. This is called the *saturation current,* and further increase of potential difference between the electrodes causes practically no increase in current, unless, indeed, a sparking potential is reached. It is this saturation current that is used as a measure of the ionization of a volume of gas, and so as a measure of the intensity of the ionizing radiation. The potential difference necessary before the saturation current is attained depends on the shape of the electrodes and their distance apart, the shape and size of the vessel. But it is to be especially noted that with the same vessel and electrodes, the saturation potential difference varies greatly with the intensity of ionization of the gas. With the ionization produced in air by the rays from substances having an activity of the order of uranium or thorium, with the electrodes a few centimeters apart, 100 volts will usually be sufficient to remove the ions as fast as they are separated, but when radium bromide is the source of the rays a thousand volts will not give a saturation current, unless the radium is spread out very thinly over a large area. Rutherford dissolved a quarter of a milligram of pure radium bromide in water, and then let the solution evaporate from the surface of a plate of 100 sq. cm. area, and then measured the saturation current. On the other hand, in cases where the number of ions is small, the chances of collision and consequent recombination are small, so that in measurements of atmospheric ionization and the like one volt per centimeter is sufficient to produce the saturation current.

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The form generally given to the apparatus for testing the radio-activity of solids is that of two horizontal plates to serve as electrodes, enclosed in a metal box of convenient size and shape, which box is connected to earth. Both electrode plates are insulated from the box. The lower one is connected to a battery of dry cells or storage cells, giving at least 100 volts. The dry cells are found preferable to the storage cells, since for this work they will last years and require no attention whatever. The upper electrode plate is carefully insulated from the box and other conductors, but is connected to one pair of quadrants of a quadrant electrometer, which must have a light needle, that will follow quickly any change of potential between the quadrant pairs. A key is provided by which this set of quadrants may be kept grounded until it is desired to observe the rate of charging, when the key is released and the time it takes the needle to move over a certain number of divisions on the scale is noted.

The radio-active solid to be tested is finely pulverized and spread very thinly and uniformly over a metal plate, which is then placed on the lower electrode in the testing vessel. As the rays from the active material ionize the air between the electrodes the ions are drawn to the plates, or, to use the commoner expression, a current flows between the plates. As long as the electrometer and upper electrode are grounded the charges which are thus continually brought to the upper plate run off to earth and the electrometer needle remains at zero. To measure the current between the electrodes the earth connection is broken by releasing the key and the electrometer needle moves over the scale. The number of scale divisions the needle moves over in a given time is proportional to the rate of increase of potential of the electrometer quadrants, and so to the current between the electrode plates in the testing vessel, which in turn is proportional to the ionization of the gas, and so to the intensity of the radiations which produce the ionization. The rate of charging of the electrometer must not be too rapid, or the meter will not keep up with the difference of potential between the quadrants. All that is necessary to decrease the rate of charging is to attach a suitable capacity to the electrometer, which will cause it to fill up more slowly.

In order to get the maximum effective radiation from a given mass of substance, it is very essential that it be spread out very thinly, otherwise the radiation from the deeper part of the layer will be greatly absorbed by the upper part of the layer. When we remember that the alpha rays are half absorbed in a thickness of one-two-hundredths of a millimeter of aluminium we see how important this is. If a thick layer is used, unless the beta rays are present in large proportion, the resulting ionization will be found proportional to the area exposed and not to the thickness or mass, for after a certain small thickness is reached the alpha rays from the bottom part of the layer are all absorbed in the material, and do not get out to ionize the gas.

Metallic uranium or the oxide of uranium is generally taken as the standard, and comparison made weight for weight between it and the radio-active substance under test.

(Test of the absorption of the radiations by screens of different materials and

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varying thickness have been made by covering the layer of radio-active material with the screen and waxing down the edges to prevent any leakage of radiation or radio-active gas there. It was in this way that Rutherford investigated the relative penetrating powers of the alpha, beta and gamma rays and their relative proportions in the radiation from various sources. Polonium sends out only the alpha rays, which are almost completely absorbed in a single sheet of paper or metal foil. Thorium gives off most of its energy as alpha rays, while uranium gives off the greatest proportion of beta rays. The gamma rays are not easy to detect, except in the case of the strongly active radium preparations, since they constitute such a small fraction of the total radiation. They are closely associated always with the beta rays. From any container that radium is likely to be kept in for medical use, only the beta and gamma rays escape.)

If a liquid is to be tested for radio-activity, it may be put in a very shallow dish on the lower electrode plate. For examining radio-active gases the testing vessel has been usually made in the form of a metal cylinder with closed ends, and a rod running down the axis of the cylinder but insulated from it. The cylinder is connected to a source of constant potential and the central rod to the electrometer. Any radio-active gas in the cylinder ionizes the air, and the degree of ionization is measured by the current that flows from the cylinder to the rod. The rate of decay of the radio-active gas or emanation furnishes a ready means of detecting and identifying thorium and radium. If air is drawn over the radio-active substance, especially if the substance is either strongly heated or brought into solution, both of which operations increase the emanating power, and thence into the testing vessel, its radio-activity will decrease at the rate of half in about a minute if it is due to the presence of the thorium emanation, while it will decay much more slowly, half in four days, if it is due to the radium emanation. Perhaps the most interesting application of this method of qualitative analysis has been the work of Elster and Geitel on the radio-active gas in the atmosphere and in the soil, and of Bumstead on the radio-active gas in natural water. By observing the rate of decay it has been ascertained that the radio-active gas in both cases is the radium emanation. Water will dissolve quite an amount of the radium emanation, which may be got out of it again by bringing it to a boil. Such radio-active solutions lose their activity rapidly by diffusion out of the emanation if uncorked, but if tightly corked lose their activity only at the rate of decay of the dissolved emanation; that is, half in four days.

While the quadrant electrometer is the instrument of widest range of application to the measurement of ionization currents, it is not the only one, nor is it in every case the most suitable one. The current that passes between the two plates of the testing vessel when one of the highly concentrated radium preparations is under test can be measured directly with a sensitive galvanometer. On the other hand, the so-called natural ionization of the atmosphere and the slight ionization due to the radio-active gas present in some natural waters, is so slight that an electrometer and testing vessel have too great a capacity, and in these cases recourse may be had to one of the forms of gold-leaf electroscopes. Many forms

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of the simple electroscopes have been described from time to time, differing somewhat according to the particular use to which it was to be applied. The chief concern in the construction of one is to have the insulation of the charged gold-leaf system as perfect as possible, to which end various insulating substances have been proposed and used, hard rubber, sulphur, amber and fused quartz. When provided with a scale and carefully calibrated, an electroscope becomes an electrometer, which while it cannot compete with the quadrant electrometer in accuracy or rapidity of measurement, possesses the advantage of portability and extreme simplicity.

There are at least two serviceable electroscopes offered for sale by American makers at present, one by a New York firm, the other by a Boston firm. The first one has two plates, 2 to 7 cm. apart, between which the matter to be tested is to be introduced, preferably spread out thinly over the lower plate. The upper plate is supported from a bushing of hard rubber in the top of the case by a stem to which a strip of gold-leaf is attached. There is a scale at the back of the case, by means of which the position of the leaf at any moment may be noted. The upper plate and leaf is charged by means of a hard rubber rod rubbed with flannel, and a fairly good comparative test of the activity of materials that are placed on the lower plate may be made by finding the time required for the leaf to move over a certain range on the scale. The other instrument has a much smaller capacity, the charged system consisting only of a strip of brass and the gold-leaf hanging parallel to it, which system is supported by a frame of very small fused quartz rod. This type is more delicate and appears well adapted to detecting and measuring small amounts of radio-active matter, especially gases. Both instruments are enclosed in suitable cases, mostly metal, but provided with glass windows through which to observe the leaf.

In using an electroscope frequent tests of the rate of fall of the leaf with no radio-active substance near should be made, in order to detect defects in the insulation. No insulating material will remain in good condition unless kept very dry and free from dust. To get quantitative results of value the scale should be calibrated by putting some uranium in the electroscope, which will give a uniform ionization, and noting the spaces moved over by the leaf in successive equal intervals of time. Each of these spaces represents the same amount of leakage from the leaf, and they will generally be found nearly uniform over a considerable portion of the scale.

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THE EFFECT OF THE RAYS OF RADIUM UPON THE MUCOUS MEMBRANE OF THE LARYNX; A PRELIMINARY REPORT.

By W. Freudenthal, M. D.,
of New York, N. Y.

Radiotherapy has occupied of late an important place in the treatment of disease and is perhaps destined to revolutionize directly or indirectly our entire system of therapeutics. I say perhaps—perhaps not. At any rate all these rays are of the greatest interest to us and it is worth while to study the physiological effect of the latest and most wonderful rays, viz., those emanating from radium, and is not the mucous membrane of the larynx an excellent field in which to observe the changes to which they give rise?

The gross effect of radium on the skin, on the eye, on the nervous system, etc., has been studied by many competent observers. But to demonstrate, *ad oculos,* its effect nothing seems to be more suitable than the mucous membrane

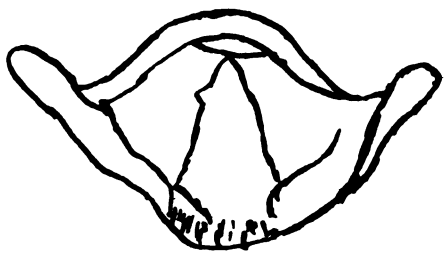


FIGURE 1.

Left vocal chord ulcerated. Stalactitic excrescences in the inter-arytenoid space.

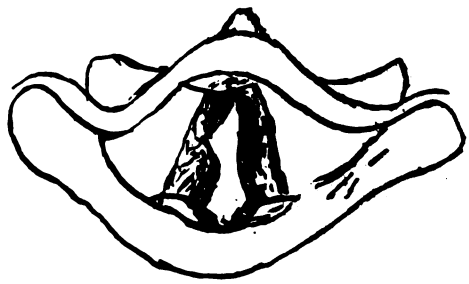


FIGURE 2.

Showing changes after the use of radium for six days; ulceration.

of the pharynx or larynx. The only excuse I have to offer is that only one case has been followed up in this manner, but I hope to report others in the future. I have not read anything in American or foreign publications on this subject and this induces me to make this preliminary report.

I chose with the consent of the patient, an advanced case of tuberculosis of the larynx, knowing that no harm could result from this treatment, and that we could promptly intervene or stop its use in case anything unforseen should arise. That such an occurrence would be observed quicker in the larynx than elsewhere we know from analogous experiences.

The history of the case is as follows:

Mrs. Y, age 37, was referred to me by her family physician, Dr. Stadtmueller on account of tuberculosis of the larynx. She gave the following anamnesis: She had been attacked with influenza a year ago, cough set in immediately and her physician very soon found the left lung affected with tuberculosis. About three months ago hoarseness developed and a tickling in the throat that annoyed

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her greatly. Occasionally there was pain on swallowing. During the last month her temperature (in the rectum) varied between 99° and 102.2° F.

Status praesens May 3, 1904. Marked postnasal catarrh and granular pharyngitis. In the larynx the right vocal cord is excavated at the end of its anterior third due to a deep ulceration that is partially cicatrized. The other portions of this vocal cord are retracted and slightly infiltrated. The left vocal cord shows irregular edges and is also retracted. The arytenoids are a little oedematous in appearance and the inter-arytenoid space presents small excrescences like stalactites. (See Figure 1.) Patient is aphonic and can talk only in a whisper. The left lung is affected in its entirety with a big cavity in the upper lobe, as also is the upper and middle lobe of the right lung.

As I wanted to study the physiological effect of radium on the mucous membrane, I thought this a good case and applied it directly to the larynx. A small glass tube containing 0.25 grammes radium of 20,000 strength was put into a receptacle recommended by my friend, Dr. Max Einhorn of this city, and the whole screwed on to a strong probe. A sterilization of all the parts could easily be done. The probe was bent so as to fit the shape of the larynx and inserted after thorough cocainization. The patient took the probe between her teeth, while an assistant supported its end. The patient afterward learned to hold the probe alone, so that an assistant was not necessary. The first time after the introduction of the bucket, patient could hold it only for one minute, being somewhat excited over the new procedure. Right after she tolerated it for eleven minutes and after a short interval for another ten minutes, so that radium had been applied at the first sitting altogether for 22 minutes. After leaving my office she felt somewhat dizzy and drowsy, but she suggested herself that this was due to the cocaine.

May 19.—Radium applied first 20 minutes and then 10; altogether 30 minutes.

May 20.—Coughed up some blood twice yesterday. Larynx looks somewhat irritated; left vertricular band swollen, other parts congested. She tolerated radium to-day only 20 minutes.

May 21.—Swelling of left ventricular band appears diminished, but right vocal cord much infiltrated. She spoke this morning with a low, though rough and harsh voice. No more cocaine used before applying radium, otherwise same treatment.

May 22.—Same treatment with radium for 30 minutes.

May 23.—Same treatment with radium for 30 minutes. Larynx more irritated than before, infiltration on both sides growing stronger.

May 24.—Same treatment for 30 minutes. Complains of pain in throat, orthoform insufflated after radium treatment.

May 25.—The infiltration of the right vocal cord is so extensive that the former appearance has changed materially (see Fig. 2). Besides, both sides of the larynx are so much thickened (infiltrated) that slight dyspnoea has set in! The interarytenoid space shows one large ulceration where formerly excrescences were. Radium discontinued.

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May 26.—As irritation is less marked, radium treatment resumed.

May 27 and 28.—Same treatment.

May 29.—To-day again all the parts show more infiltration, especially the region of the left arytenoid. Radium discontinued again.

May 30.—Irritation lessened and radium applied for 30 minutes.

June 1.—Radium applied. Larynx appears the same as during the last two days. Patient leaves the city for Sullivan county.

This short history is full of interest to us. Although it is well established that chronic cases of laryngeal tuberculosis can readily stand any surgical intervention like curettage for example or other manipulations in the larynx, it was a matter of surprise to us to see that debilitated woman hold the radium in her larynx uninterruptedly for 30 minutes. She could have done it longer if I had wished so. But I thought 30 minutes' exposure sufficient.

The fact that radium gives off heat was known to me, but patient did not notice any heat at all nor anything else while her larynx was exposed to the emanations.

Most remarkable were the granulations (infiltrations) springing up from different parts of the larynx thus diminishing its lumen materially. For that reason we were compelled twice on account of slight dyspnoea to interrupt the treatment. A day sufficed to restore these parts and widen the glottis. The granulations that sprung up so quickly after a few exposures are analogous in one respect to the changes produced by injection of the old tuberculine. All those who remember the first injections of Koch's old tuberculine at the end of 1890 and early in 1891, when large doses were given, will perhaps also recall the occurrence of large granulations arising in the larynx in cases complicated with tuberculosis of that organ. I myself recollect one of my cases in which tracheotomy had to be performed on account of dyspnoea due to this cause.

What are the forces that produce such similar effects from two such dissimilar agents as tuberculine and radium? Will the future ever clear up this and similar questions? Let us hope so at least.

The patient was delighted when she could talk with a loud voice one morning. But the pleasure of this apparent improvement was only subjective. The granulations springing up so rapidly caused some sort of approximation of the vocal cords and consequently a louder voice. With the disappearance of the oedema and the granulations the voice, too, disappeared.

Whether the pathological conditions in the larynx of this case have been benefited by the radium I shall not venture to decide. Now, eight weeks after leaving the city she writes that she continues to feel easier in the throat. The tickling sensation has disappeared to a great extent and so far she has had no pain in the throat.

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VALUE OF VARIOUS CURRENTS FOR THERAPEUTIC PURPOSES.*

By C. S. Neiswanger, M. D.

of Chicago, Ill.

Professor of Electro-Therapeutics in the Chicago Post-Graduate Medical School and Illinois Medical College, and President of the Illinois School of Electro-Therapeutics.

The history of the practice of medicine is full of instances where the specific of to-day receives the widest possible use and then is laid aside and almost entirely forgotten. Later on, it again gains the favor of the medical profession. A particular instance of this is the history of calomel, which we now give by perhaps a modified method and in different dosage, but still recognize its great value. Many such facts prove that the practice of medicine is not an exact science, but it comes nearer to exactness in the use of electricity than in the use of drugs. What a change has been worked in the practice of medicine in a few years by this agent! The more we study the more are we convinced that we are electrical machines and require a more intimate knowledge of electrical phenomena to understand the various functions of the house in which we live.

The treatment of disease by electricity varies but little from drug medication in the history of dropping the old for the new, then reverting again to the old.

I am a great stickler for the old and well-tried and believe we have in them something which the newer modalities can never displace.

The object of this discourse this evening is merely to bring out a discussion as to the value of different currents in the treatment of diseased conditions. Just at present the medical profession seems to have gone antipyretically crazy and to my mind these agents have little real basis for their popularity. I do not doubt that this statement will meet with vigorous opposition, but those of us who have read the experiments of Bernard and others must come to the conclusion that the bacillus of recurrent fever is naturally destroyed by the rise of temperature which takes place as a reaction to the toxins. At a temperature of 102° its growth is inhibited. The typhoid bacillus is inhibited at 102° and destroyed at 104°. Gonococcus is inhibited at 100°. How foolish, then, to give coal tar derivatives which depress the heart in order to reduce the temperature and actually encourage the growth of these bacteria. To my mind, this temperature is a natural reaction and ought not to be too quickly depressed. The rational method is, to allow the fever to take its course to a certain extent, and control its worst features with drugs.

In the passage of a galvanic current through a resistance such as the human body, heat is evolved and this has much to do with the destruction of bacteria along such path.

It is not my purpose to quarrel with advocates of other methods of treating these diseases, nor would I even criticise the homeopathist whose methods of treatment I know very little about, but I am satisfied they get good results. From

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Read before the Chicago Electro-Medical Society, May 31, 1904.

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my viewpoint they would seem to give very little or no medicine in their higher dilutions.

Take Bernard's experiments again. He found that two animals infected with erysipelas would show a marked difference in history if one was kept warm and the other was given antipyretics. The one in the heated room gets better very much faster than the one dosed with drugs.

Treatment of stricture of the urethra is a mooted question to-day. Keyes and others condemn the method and in an extensive number of experiments before the Academy of Medicine years ago, demonstrated to the satisfaction of many that there was very little value in galvanism; but these experiments were performed when there were no instruments of precision and little was known of the remedy. One of the stock arguments against galvanism at that time was that it will cause stricture, and certainly it will do this when improperly administered. I do not know why the work of Newman carried on for so many years has not carried conviction to a greater number, especially when the adherence to his technique has brought uniform success and has wrought cures after operative measures had failed, and yet I find if his technique is departed from even a very little, failure will surely result. Still, some are using other currents for stricture of other parts of the body; for instance, high-frequency is being used for strictures of the rectum and the deep urethra, and while for the sake of argument we may admit that it has some good effects, the frequency with which the sound is introduced causes the urethra to be irritated. The conditions in which galvanism will be of assistance can be divided into two general classes. We cannot expect bleeding to be stopped by the negative pole and if we treat a vascular region with this pole we are sure to be disappointed. The other condition is to allay inflammation. The negative pole is indicated for the absorption of stricture, yet it is worse to treat an irritated discharging granular condition with that pole. The stricture must be ready to treat. It is the improper selection of cases that causes disappointment.

Now, I have my doubts as to how the high-frequency current can perform these two functions. Indeed, what shall we expect it to do? Will it absorb the bands of cicatricial tissue? This is too much to expect of it, because it will not produce electrolysis.

The old Germans have a certain way of operating and many of them are very fine surgeons, but each operation has to be done exactly as it was taught in the university. It seems to me that strict adherence to a definite technique is very good, especially in the treatment of stricture, provided it does not lead one into a slavish subservience to a method.

In pelvic diseases the commonest picture we observe when looking into the speculum is the plug of albumen hanging down from the cervix, showing that there is a condition of catarrh of the mucous membrane, one of the principal causes of sterility and dysmenorrhea. How shall we treat such a condition? There is no better method than to apply the positive galvanic pole, turn on the current and allow it to stick. The entire plug will then come away with the electrode. It would be absolutely impossible to swab out the albumenous plug.

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This is, in fact, a galvanic curettement and not at all inferior to the surgical measure, for after such a treatment an examination will show that the electrode has removed all the mucous surface clear down to the nebothian glands. Besides this we have deposited the oxychloride of copper in the cervical region, which, by its antiseptic action, destroys the germs that are exerting their influence in the part.

I have treated my eighth case of pus tubes with galvanism, a condition uniformly considered as requiring an operation. I offer nothing to this class of patients, although I have confidence that the treatment will be of service to those who refuse to undergo an operation. The copper electrode does not need to penetrate even the uterus, because when placed in the vagina against the diseased tube, the electric current carries the copper into the surrounding tissues, thereby destroying the staphlococcus and streptococcus. These troubles, after existing for a long time, will become attenuated by nature if drainage is good and proceed to a cure without treatment; thus a pyosalpinx will become a hydrosalpinx, the same as gonorrhea does gleet. To be sure, we have evidence that the gonococcus infection never leaves the region, but many cases certainly show no clinical manifestations.

It is not always necessary to operate and open up pelvic abscesses, for the copper oxychloride will destroy the pus organisms by its chemical action, and the current at the same time produces a mild irritation which leads to absorption and elimination of the content which has now become sterile.

The faradic current is purely mechanical in its action, stimulating the muscle cells to grow and thus building up the tissue in which the muscular element has been largely atrophied. It is also a good diagnostician and a few points regarding its action may not be amiss. If the pain of a neuralgia is decreased by pressure upon the part, faradism will cure it, but if the pain is increased by pressure, faradism will make it worse and one must resort to positive galvanism or some form of static.

If a mild current of galvanism when applied within the pelvis causes pain and that pain is relieved by a rapidly interrupted faradic current, there is no pus present in the adnexa; but if the pain caused by the galvanism cannot be relieved by the high-tension faradic, we will always find pus when we operate.

In peripheral paralysis, where the trouble is situated in the motor cells of the cord, the muscular contraction to faradism is less than normal or may be entirely lost, while if the paralysis be of brain origin, the muscular contraction is exaggerated.

After a muscle has lost its contractibility to faradism, as in peripheral lesions, and cannot be exercised by that current, it will often respond to an interrupted continuous current which may now be employed for purposes of massage.

Now, I very well know that some of my colleagues present are devoted to the newer forms of electricity. I would like to know how these currents do the work and what we may expect their action on diseased tissues will be; otherwise their use would seem to be to a large extent empirical.

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DISCUSSION.

Dr. Rice said that she agreed in every particular with Dr. Neiswanger in regard to the efficiency of galvanism and faradism and that she did not believe that the high-frequency current would displace the galvanic and faradic currents.

Following Dr. Neiswanger's technique, she used both of the latter, but she had also found the high-frequency current of great value. In a case of stricture of the rectum, she believed that better results had been obtained with the high-frequency current than could have been produced by galvanism.

A patient, 30 years of age, had been operated upon a year and a half before by Dr. Ochsner for stricture of the rectum. In answer to a letter from Dr. Rice asking the nature of the case, he replied that she had been operated upon for stricture and that another operation would be necessary, but failed to state the cause of the stricture. The patient gave a history of syphilis, however. The stricture was high up in the rectum and very narrow. There was a fetid and bloody discharge from the rectum and the patient was suffering a great deal of pain. After three treatments, with the high-frequency current by means of the rectal glass vacuum electrode, the patient reported that she had had complete relief from pain and natural evacuations without medicine.

This was an unexpected change, because for months previous strong cathartics had been necessary. Dr. Rice also gave compound mercury and iodine treatment for three or four days, but discontinued for the sake of determining the result of the high-frequency current alone. Treatments had been given three times a week for four or five weeks with steady improvement in the stricture. There was much less discharge and the patient was without pain.

As to endometritis, galvanism was by all means the most serviceable, although it is possible that the high-frequency current would do as well if the glass vacuum electrodes could be made small enough to be introduced into the uterus. In inflammation of the uterus and ovaries, where there is much tenderness, she had not always found galvanism to be well borne, while the high-frequency current as a rule gave relief.

Dr. Rice cited a case in which the ovaries were much enlarged and prolapsed, in which copper electrolysis had been tried, causing great pain. Several surgeons had told the patient that the removal of the ovaries could not be avoided. The high-frequency current had been used on this case twice weekly for about six months, giving relief from pain and causing the ovaries to decrease in size until now the surgeons admit that no operation will be necessary.

Dr. Lave said he thinks Professor Neiswanger is perfectly safe in his estimation of the efficiency of faradism and galvanism. Indeed, if it had not been for faradism we would not have had the induction coil nor the high-frequency current. We cannot do without electrolysis or cataphoresis. They will always be of high therapeutic value. However, we do get an anaesthetic effect with the high-frequency current because it is sedative in character, and, moreover, we can use more than eighty times the amount of milliamperage that we could

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employ with galvanism. Indeed, it is not difficult to get a very severe burn when using the galvanic electrodes in a careless manner.

The following are the currents used by the electro-therapeutist:

I. Galvanic.
II. Induction coil (faradic).
III. Sinusoidal.
IV. Static.

Then there is the cautary current employed in surgery.

No two of these types can be derived from the same battery or apparatus.

It stands to reason that the person who has at his command all these currents or any number of them, is better equipped than the person with a knowledge of only one. Still, as Professor Neiswanger has stated, the pendulum may swing too far one way and the electro-therapeutists discard the old and tried currents for the new, forgetting that each modality should be used as the indicators direct.

We all know that it requires voltage to overcome resistance, and while with the galvanic we use 20 to 30 volts, with the static and high-frequency we have at our command voltage up in the millions.

Dr. Coleman said that while all roads lead to Rome, there is no such relation of subordination in the various electric modalities. All are independent and have different uses. In the main, galvanism is used for the local effects. If what Dr. Neiswanger says is true, galvanism does not increase metabolism. It does not affect the amount of carbon dioxide liberated or the amount of urea excreted. It is therefore evident that such constitutional diseases as diabetes, pernicious anaemia, and locomotor ataxia should not be treated with galvanism. On the other hand, the high-frequency current does not seem to be limited to local effects and it therefore is used in such general diseases as those mentioned.

As an example of all the roads, we may cite the following:

In the treatment of granular lids it is possible to use the copper electrolysis of galvanism, the high-frequency current or the X-ray. The X-ray treatment seems to produce most rapid improvement. The high-frequency comes next and cupric electrolysis last. The high-frequency current is more agreeable in its effect than the galvanic.

Mr. Treadwell said that from his studies in the medical school he was sure that very little credit was being given to electricity as a therapeutic agent. He felt that it was an unscientific state of affairs for one body of men to claim that they are getting results from the use of a certain agent, while another body of men state that the agent is of little value and that its claims have been fully investigated. He felt that electro-therapeutists must place their results before the medical profession and demonstrate to open-minded scientists the value of these different forms of electrical energy. When there is a disposition to question diagnosis and results of treatment, the patients could be sent to competent diagnosticians. This has been done in a few cases to his knowledge and the patient then put under the care of an electro-therapist. In this case alluded to, he felt

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sure that both the diagnostician and the electro-therapist would stand by the results. This ought to be done until electro-therapeutics receives its just place in the practice of medicine.

Dr. Burdick said that there is a financial consideration which proves this very scientific co-operation between physicians as unpractical and, unfortunately, even stands in the way of a full recognition of what would seem to be actual demonstration. Some two years ago he had a case of tuberculosis of the knee-joint, referred to him for X-ray treatment. Diagnosis had been made by a competent surgeon; fluid had been withdrawn from the knee and examined. He took a couple of skiagraphs of the knee-joint and found that one-half of the synovial membrane and cartilage was involved in the tuberculous process. After treating the patient for four months, all the symptoms of the disease disappeared and the patient had perfect use of the joint; six months after there was no return. When the patient saw the surgeon he said that there was a question about the diagnosis of such a condition, as there had been spontaneous cures of what were taken to be tuberculous lesions. Another case was seen by a surgeon in which a diagnosis of tuberculosis of the lungs had been made and the patient was pronounced in a hopeless condition. After four months' treatment the patient seemed to be in perfect health, and yet the surgeon would not stand by his first diagnosis. A number of such cases had come under his observation and they had improved, but physicians uniformly would doubt their diagnoses. All electro-therapists must stand upon their own foundations and not expect other physicians to send cases to them, as the majority of the medical profession is not interested in proving anything.

All these currents are forms of motion. They represent various phases of kinetic energy and therefore they are really galvanic currents of the same thing—namely, electrical currents. For instance, the galvanic current is steady and is unidirectional; the faradic is an interrupted motion. The particles are polarized and only rapidly revolve, while with the alternating currents they revolve first in one direction and then in the other, giving reverse polarity for each alternation. With the high-frequency current we get polarity and motion in both directions, but the atoms travel at an unusually high speed. There is an ionic shower which we call cataphoresis, that accompanies the slower forms of motion; the atoms are disassociated. All of these currents give us a massage of atoms with some destruction in the slower forms, but with the high-frequency we get an atomic massage of atoms, without any disturbance; consequently we get the increased nutrition and resulting vigor following the prolonged use of the high-frequency, the same increased nourishment that follows muscular massage. I think, in the past, too much stress has been wasted upon electrolysis and not enough upon the physical side of nature. We break weak cells and freshen up normal cells by bringing more blood to them. The high-frequency polarizes the entire body, the discharge being more powerful at the electrode and the effects more prominent in this region than at distant parts of the body. Still, the discharges do affect all parts of the body. The patient increases in weight.

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Dr. Burdick has a resonator in contact with one of the largest coils in the country. His resonator is excited by 10 amperes from the line. The patients are all satisfied. The cases he gets are for the most part those which are pronounced incurable by physicians. These are the only ones they are willing to refer to him. One case had had four or five operations and at last developed a condition of neurasthenia. She had fits which were not hysterical and not epileptic, but the patient would suddenly fall prostrate without any premonitory symptoms of nervous disturbance. She had pus tubes and the pelvic organs were in a state of chronic inflammation. He tried a number of different modalities without much improvement, each seeming to rather aggrevate the trouble; he used a high-frequency without result, until he substituted the alternating current, the electrodes being placed at the nape of the neck and at the pit of the stomach. The improvement was very marked. She put on 16 pounds in weight. The fits left, there were no more pelvic pains and the entire pelvic region seemed to be improved.

Copper electrolysis had been tried without result; indeed, it produced much discomfort and showed a disposition to produce ulcers that resisted ordinary methods of healing. The results of the treatment were so pronounced and her condition improved to such an extent that it was thought advisable to operate. She took the anaesthetic well and there was no bad result. Both tubes were found full of pus.

The larger the amperage the more atoms are moved, while by increasing the E. M. F. we accelerate the speed with which the atoms move. The static machine and the faradic coil each has its place, and produces a motion that is valuable for certain conditions.

Dr. Neiswanger said that he liked this explanation given last and felt that there was some basis for scientific use of high-frequency when explained in this manner. He felt, however, that galvanism had fallen into disuse in many cases because of the laziness of the operator.

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FUNDAMENTAL PRINCIPLES OF ELECTRICITY INVOLVED IN THE STATIC MACHINE.*

By Gordon G. Burdick, M. D.,

of Chicago, Illinois.

Chief Surgeon People's Hospital, Professor of Radio-Therapy and Photo-Chemistry, Illinois School Electro-Therapeutics; Associate Professor Surgery, Chicago Post-Graduate Medical School; President Chicago Electro-Medical Society.

In all the developments of electric machinery in industrial and scientific uses, certain facts stand out; something passes to a considerable distance from the source of energy. The old molecular theory of electricity was first accepted—namely, that electricity was a sort of fluid which could be sent along a wire, somewhat as a current of water would circulate in a water pipe. This theory was not much questioned until the discovery of the X-ray, when it was found inadequate to cover all the phenomena.

Matter is made up of very complex molecules varying from 2 atoms in the hydrogen molecule to 40,000 atoms in the molecule of the tox-albumens. Chemists had come to believe that it was impossible to destroy the atom or to change it in any way, and it is only in very recent months that investigations into the nature of the X-ray have led scientists to believe that the atom can be separated into still smaller parts. They were led to this view by results of their experiments to determine the velocity and the mass of the particles making up the cathode stream, and it was discovered that this velocity was equal to that of light, a speed which it would be absolutely impossible for atoms to acquire; while the mass was found to be 1-1000 that of the hydrogen atom. Sir William Thompson suggested that these particles be called corpuscles. The atom is therefore a compound body.

Researches with the remarkable element radium as performed by the Curies and others, have also led to a broadening of our ideas of matter. In January, 1902, Prof. Ramsey was observing the spectrum of radium and found it did not agree with the spectrum he had previously mapped out, but discovered that it agreed perfectly with the spectrum of helium. He was thus able to see the birth of a new element and he has done possibly more to advance our knowledge of chemistry than even the experimenters with the X-ray have accomplished. Up to that time physicists had decided that there were no further variations in the elements and that an element could never be changed into anything else. Another axiom which has been held to by physicists is the law of the conservation of energy—that energy cannot be obtained from nothing and those who have endeavored to obtain perpetual motion have been called dreamers, cranks and fools. Still, if a large quantity of radium were put under a boiler, it would keep on changing the steam for a considerable length of time without any apparent source of outside energy being resumed. All the scientists who decry perpetual motion have neglected one truth—that some substance stands between perpetual motion and success—and when we find this substance that will pass off the

*Read before the Chicago Electro-Medical Society, March 29, 1904.

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magnetic lines of force without absorbing too much energy, we will have perpetual motion. Some twenty years ago I very carefully tempered a piece of steel and magnetized it by putting it in the center of a helix and throwing in the current. At that time I very carefully estimated the energy of the magnet. About a year ago I dug out this old magnet from a lot of rubbish and, on measuring its lifting power, I found it had not lost any of its magnetic strength in the twenty years. It is true I have expended energy in magnetizing the magnet, but here for twenty years it has been giving out its energy in keeping extended its magnetic lines of force, and it has thus given out more than one thousand times the amount of energy expended upon it and will do so for unknown years in the future. The only thing that stands in the way of perpetual motion is to find some substance that will cut out the magnetic lines of force and yet not require energy to place it in the field or take it out of the field.

We indeed have a substance which will screen the magnetic lines of force, but it takes more power to pull it out of the field and replace it than can be obtained from the magnet. Copper or soft iron will cut off every magnetic line. It is therefore not so fantastic an idea to find an element which will cut off the magnetic lines of force. I believe it exists and when found it will be at once applied.

Where Does Energy Come From?

Sir William Crookes has made a spinthariscope which consists of a little cylinder, an eye-piece, a fluorescent screen of zinc sulphide at the bottom of the cylinder and a grain of radium bromide supported just above the screen. It is not too much to say that the pyrotechnic display is really produced by the explosion of atoms of the radium bromide and the corpuscular bombardment of the zinc sulphide screen by these exploded atoms.

If radium has half the wonderful properties already attributed to it, it is surely more remarkable than the element looked for by the perpetual motion cranks.

Another curious fact about radium is, that it is always 3 degrees above the atmospheric temperature surrounding it.

Another interesting fact is, that the closer it is to oxygen, the more active the explosion of the atoms become.

Many physicists regard the atom as composed of a central positive ion which holds a number of negative ions within its attractive influence. The ion is indeed a stumbling-block, because the question is, Where do these ions get their positive and negative charges? The central positive ion, I believe, is a giant corpuscle, and the small ones are negative. I believe that this central ion is derived from some catalytic substance the nature of which is not well understood, and I have a number of substances in mind which present peculiar properties and which substantiate this view. For instance, if alcohol be placed in contact with spongy platinum, it is changed into acetic acid. The spongy platinum is not changed, but the temperature of the metal has been increased. Consider another of the very common substances—water. It was not supposed for many centuries to be

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anything else but an element. In time the experiment was tried of sending an electric current through the water, and it was found that at one pole a very light gas was given off and at the other pole a much heavier gas. If these two gases were mixed, they might be kept for an indefinite length of time in the same receptacle without any change, although one is electro-positive and the other electro-negative. They will not unite, although they have a chemical affinity for each other. One of these gases is hydrogen; its specific gravity is very low. The other gas is oxygen; it will turn litmus paper red. It is acid in character. If a glowing match be placed in it, the match will burst into flame. After these gases have been mixed for an indefinite time in the same receiver, they may be made to combine at any moment by applying certain forms of energy. If the electric spark be passed through this mixture, a violent explosion will take place and a few drops of water will be formed on the sides of the containing vessel. Again, if spongy platinum be placed in the mixture of these gases, the same explosion will occur. We could use this platinum a number of times for this purpose and thus we see that there are not many chemical reactions that can be produced without energy, and reactions cannot take place without it; but it is still possible to obtain them by the use of a catalytic substance which must have a peculiar form of motion inherent in it. Many of these substances will produce the result without taking any active part in the process. Their mere presence seems to be sufficient; thus pepsin and the other enzymes which take part in digestion bring about changes, but they are not changed themselves.

These facts make me believe that the giant positive ion in the center of the atom is the substance which has been derived from some catalytic substance.

The ether is a medium whose properties are needed by the mathematician in explaining a great number of phenomena. Physicists have been inclined to accept the ether without question. All believe it a homogeneous, structureless, jelly-like fluid that pervades all space. No, it has no specific gravity, although mathematicians and physicists have ascribed inertia to it, holding that it requires force to move the ether. If we impart a blow to it, the wave spreads out in all directions through space. Thus, a distant star may set up a wave motion in the ether which requires thirty years to reach our planet, and the light waves have spread from this star to an equal distance on all sides. We have been conscious of only a very small range of these vibrations, but we are gradually devising apparatus which will bring within our knowledge more of these unknown and often unsuspected vibrations.

With a small positive or negative field, it is possible to produce electro-magnetic effects at only short distances, but with a greater positive or negative charge we find that the disturbance can be carried to still greater distances. The effect decreases in geometrical progression as the distance increases. Thus, if we have one volt of E. M. F., and if we place a wire parallel with this at a distance of 4 inches, no effect will be produced in this second wire so far as the eye can see; but if we have a delicate galvanometer attached to this second wire, it will indicate a momentary current of electricity in the second wire when the

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current in the first wire is either made or broken. This second current has very small amperage, but is always of greater E. M. F. If now we have 4 volts in the first wire, then the second wire can be removed to a distance of 16 inches, and when the current is broken in the first wire, the current is produced in the second wire, flowing in the opposite direction. If the current runs steadily in the first wire, there will be no effect whatever in the second wire. As the E. M. F. is increased in the first wire, the second wire can be removed to still greater distance.

By the will of Peter Cooper, provision was made for the erection of an electrical building in connection with the Cooper Institute. This building was constructed without iron or steel in order to minimize as far as possible the magnetic effects about the building. It was expected that the fluctuation of any electric or magnetic force received from the sun could be measured in this building. Unfortunately, a street-car company erected its trolley wires to within a quarter of a mile of the building and every automatic instrument in the building records every variation in the current running on that wire. It is thus possible to tell how many cars run or when even a single one is cut off. This principle is the same as wireless telegraphy. Every change of electro-motive force sends from or attracts to the conductor over which it is passing, a positive or negative wave. The distance the disturbance is detected depends upon the voltage of the current used. This effect of the secondary could not be due to magnetic lines of force, for the disturbance does pass to infinite distance. Marconi has been able to send messages at a distance of 1,900 miles, using less than 1,000,000 volts for his E. M. F. There is something, then, that moves to and fro from a conductor only when there is a fluctuation of the electro-motive force. If it is steady, no effect is produced. The slightest change in the voltage will set up waves that will pass to a distance in geometrical progression to the fluctuations in volts that take place in the conductor.

This change is not always away from a primary source of the energy, but it also returns. As the voltage is increased in a conductor, the disturbance passes outward, but if a conductor loses its polarity, something returns that is electrical to the conductor, since a current is generated within it. If we could conceive of a fluid the disturbances of which would always be towards the center instead of away from the center, it would account for the attractive force of gravitation. We can conceive that in an electric field there is more of the attractive power than of the repulsive force.

I have given a great deal of thought to these phenomena in the attempt to clear up the difficulty, and I believe that this theory explains all the phenomena satisfactorily. That all space and matter is filled with corpuscles with a negative charge, creating an intense magnetic fluid in which each particle is repelled by its neighbor. The field being disturbed by a shower of negative particles repelled from the sun that we call light and heat.

If we conceive all small bodies gathered around the central large body charged positively, we have the central ion surrounded by the negative smaller

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ions, thus forming the atom. The form which holds these together is simply that of a magnetic field, and it is only by applying energy in some form that we disturb the electrical equilibrium and break up the force known to chemists as cohesion. I do not believe that any physicist is satisfied with his conception of the ether, upheld only by the known fact that some method of connection exists between the inter-planetary space and the fact that it answers to mathematical equations. Any of the experiments to prove the existence of this medium are open to serious doubts. The nearest to demonstrating its actual presence was Lenard's work, after Hertz had demonstrated that the cathode ray would pass through sheets of aluminum. Lenard fitted his tube with an aluminum window at the end farthest from the cathode, and at this point he joined a second tube having the highest vacuum. He had a piece of iron in this second tube to which was attached a small fluorescent screen, and he thought that the cathode ray would not be able to pass through the second tube. Unfortunately, the mercury pump will not exhaust the vacuum so high that the current will not traverse the space. Although the vacuum of this second tube was very high, it still did contain bodies which would transmit discharge. A perfect vacuum can only be obtained by long use upon a transformer after the pump has carried the exhaustion to the limit. The free bodies are compelled to form chemical combinations under the electric current until eventually the tube will not transmit energy.

If the gas in the tube had been entirely exhausted, it could not transmit the electric energy, although light itself could pass through the tube, bringing us again against the supposition of the existence of the ether.

What Relation has this to the Static Machine?

Polarity is another property of matter. By rubbing a hard rubber rod, polarity is developed on its surface and by this property it is able to attract the light pith-ball attached to this insulated metallic cylinder, showing that the electrical equilibrium of matter has been disturbed by means of energy, in this case heat. By means of this polarity we have changed the corpuscular arrangement in the atoms of the pith-ball so that the positive corpuscle is now more attracted towards the negatively charged hard rubber rod than the repulsion of the negative corpuscle. The resulting action is that the ball is attracted towards the negatively charged rod. If we bring the pith-ball in contact with the rubber rod, the more strongly polarized rubber will increase the charge upon the pith-ball and reject it.

As soon as the distance differs, the attraction power is more or less manifested according as this distance is diminished or increased. When we have a strongly polarized surface in motion, we attract and repel these corpuscles towards and away from the surface of the corpuscles by a rapid to or fro motion in the atmosphere. They are attracted and repelled with violence, delivering their energy to the plate as they are suddenly arrested in their flight. Their energy is absorbed and motion is imparted to the corpuscles that comprise the atoms of the plates.

We thus deliver a considerable amount of energy. In the static machine

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we have an infinite resistance, therefore we are able to maintain great differences of potential and by these means attain velocities in these bodies that are surpassed only in a vacuum. If we increase the square area of the plates or increase their numbers, we increase the surface that is subjected to this bombardment and by this means increase our ampere output. We can polarize the glass, but cannot cause the atoms to rotate, as with conductors; but if we increase our potential we increase our twisting force, until eventually a complete revolution will take place, and then we are said to have a puncture.

DISCUSSION.

Dr. Neiswanger said that he had always been a stickler for the law of the conservation of energy. There was no more chance of its violation by the production of perpetual motion than that Ohms' law should fail. He believed that the experiments with radium which seem to conflict with this law are really in accordance with it, and when we know more of the physical nature of radium we will discover that the law has not been violated. The lines of force sent out by the magnet through the surrounding atmosphere seem to violate the law of the conservation of energy, but just as in all the transformation of energy in electric light circuits by means of transformers, it is found that the number of volts is not affected and, if the voltage is raised the amperage is correspondingly lowered. He regretted that he had not heard the paper read by Mr. Treadwell before the Society at the January meeting, but from the published report he felt that the present paper was not in conflict with it. This present paper considers more minutely how the charges are obtained by changes in the atomic structure of matter.

In reply, Dr. Burdick said that as far as the magnet was concerned, he must consider that the magnet had been sending out a constant stream of magnetic lines of force for many years and yet had not deteriorated.

Dr. Neiswanger replied that, according to Thompson, all magnets do deteriorate. Possibly the position of this magnet relative to the earth's magnetism had something to do with its good condition after so many years. It is known that iron or steel pipes take on magnetism when in correct relation to the earth's magnetic lines of force, and it may be possible that it was the case with this magnet. If not, the temper must have been especially fine.

Dr. Burdick replied that he had tempered this magnet himself and that the armature was placed on it so that it was working all the time.

Dr. Neiswanger replied that there have been many attempts to violate this law other than physical. Even physicians, who should know that man is a machine and must wear out, are constantly seeking an "elixir of life" or "fountain of youth," but only to find this law unalterable in whatever field it may be employed.

Only recently in a Chicago university, one of the professors discovered (?) that calcium salts and sodium chloride constituted an elixir of life. Such statements are unfortunate and do not add to the reputation of a scientist, because the laws of energy must be carried out in a body as well as in the inorganic

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world. The Brown-Sequard Elixir of Life and Koch's tuberculin are other examples.

Mr. Treadwell said that he felt his conception of energy differed considerably from that of Dr. Neiswanger and Dr. Burdick.

Energy is the ability of a body to do work, and work is done only when resistance is overcome. In lifting a weight from the floor against the attraction of the earth a certain amount of work is done, but as soon as the weight comes to rest, no more work is being done on that weight. If the weight be held, the person feels the strain and very soon becomes tired, but he is not doing any work. Again, if he pushes against the side of the wall he may become very much tired, but he is not doing any work. When work is done upon a body, that body has energy imparted to it, and it is able to do an amount of work corresponding to the work done upon it. It is therefore evident that if a weight is carried from the first to the third floor of a building, that when the weight falls to the ground its potential energy is changed into kinetic energy and it is able to deliver a blow depending upon the mass and the distance through which it has fallen. It is very evident that no matter whether the body is supported for one minute or for one thousand years, this blow will be the same, and therefore the support of the body cannot be said to be doing work upon that body. In the case of the magnet referred to, no work was being done by the magnet through all these years. When the steel was magnetized a certain amount of work was done upon it by the electric current, and this magnet now has the power to do the work, but it is only doing work when it is producing motion of magnetic bodies.

The temperature of radium salts above the surrounding atmosphere is accounted for by believing that there are sub-atomic changes going on in the atom and that the element is slowly changing into helium. The physicists are not considering that the law of the conservation of energy has been violated.

At the same time Mr. Treadwell felt that it is unscientific to hold that perpetual motion is impossible and that all who advocate it are cranks and fools, although he considers that the chances of the existence of such a substance referred to in the paper are very small. It is more scientific to say that nothing opposing our conception of the laws of energy has been demonstrated and that from our present knowledge perpetual motion is impossible.

Dr. Burdick replied that Mr. Treadwell was perfectly correct in his statements regarding energy, but that there are certain common phenomena which seem to disprove this: for instance, a small grain of musk will scent a house for many years without any appreciable loss of weight, and carmine will ionize a barrel of water, showing that it was divided into parts of which we have no conception. The magnet in question has supported its armature during the years it was in concealment, and, using Mr. Treadwell's illustrations of supporting the weight, while he got tired, as far as I could see, the support of the armature did not make the magnet tired, and it seems inconceivable to me, although considered correct by physicists, that a man supporting a 50-pound stone is not doing work, regardless of what the stone may be doing.

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Editorial.

THE PRESENT STATUS OF ELECTROLYSIS IN THE TREATMENT OF OBSTRUCTIONS OF THE EUSTACHIAN TUBE.

In the treatment of non-suppurative middle ear deafness various forms of eustachian tube obstruction must be considered. The proportion of actual strictures of the tubes is very small, while catarrhal thickening of the lining membrane, the mucus obstruction, is of greater frequency. To overcome the obstructions and strictures three methods may be employed; first, the use of air pressure medicated or otherwise through a eustachian catheter; second, the introduction of a bone, celluloid, or metal bougie, and third, electroylsis.

By air pressure is meant the use of the eustachian catheter through which air is forced into the tube. This is of doubtful value when much obstruction is present. In a large proportion of obstructive cases the second method proves entirely successful, there being but slight difficulty in introducing the various sizes of bone, celluloid, or metal bougies. There are occasionally obstructions which cannot be passed by this method. Under these circumstances the gold wire bougie connected with the well regulated galvanic current seems to be more successful. To carry out the method the catheter should either be rubber or an insulated silver catheter, the negative pole of the battery being attached to the bougie. The current should be very finely graded and at the utmost not more than five or six milliamperes should be employed, the time allowance not to exceed eight minutes. Care needs to be taken not to use too much force upon the bougie as several observers have reported cases where they have broken the instrument in-situ. No doubt this mishap usually results from imperfect handling. So far no serious results have been reported from the breaking of the gold bougies in the eustachian tube. As to the actual value of this method it may be said that it is a convenient and successful plan for overcoming strictures of the eustachian tube. It is somewhat doubtful if the electric current has any permanent effect upon the tissues, although its temporary influence is of considerable benefit. In a small proportion of well selected cases the benefit to hearing and the relief from tinnitus resulting from the use of the bougie is marked.

A NEW USE FOR RADIUM.

According to the London Lancet for July 9th, 1904, Professor Henry Dixon of the Botanical Laboratory, Trinity College, Dublin, has evolved a new field of utility for radium. The electrification of sections of specimens which are being cut by a microtome is often a source of much trouble to the operator because the electrification causes the sections to stick to the knife of the instrument and to each other. It occurred to Professor Dixon that the proprety of discharging

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electrical conditions which is exhibited by radium might be utilized to obviate this difficulty; he fastened a tube containing 5 mg. of radium bromide to the microtome knife as near as possible to the place where the ribbon of sections formed. The result of the experiment was gratifying in the extreme, all traces of the trouble being removed thereby.

Miscellaneous Abstracts

CONTRIBUTION TO THE THE THERAPEUTIC VALUE OF DREYER'S METHOD OF "SENSITISING" THE SKIN. (BEITRAG ZUM THERAPEUTISCHEN WERTH DER DREYERSCHEN SENSIBILISIRUNGSMETHODE.)

Dr. Bodo Spiethoff -- Berl. Klin. Wochenschr. P. 783, 1904.

At the university polyclinic of Prof. E. Lesser at Berlin Spiethoff took up the investigation of the above method, that was so highly recommended by Neisser & Halberstaedter (see this Journal, p. 212, 1904). He believes that the pronounced reaction wihch followed in many cases treated after Dreyer, was due to the cumulation of two irritants: viz., first, the injection of a fluid (Erythrosine), and second, to the actinic rays. Several experiments on guinea pigs seem to prove his theory.

The author's clinical experience is based on six cases of lupus. Three of these cases had been treated before with the Finsen lamp, while the others had not received any treatment at all. His results were so absolutely negative that, in spite of his limited experience he does not expect any good from this new procedure.

OPERATING IN ALTERNATING ROENTGEN AND DAY-LIGHT.

R. Greshey -- Munch. Med., Wochenschrift, June 14, 1904.

An apparatus is described by means of which in operating to remove foreign bodies or set fractures, the surgeon is enabled to look directly upon his field of operation with one eye, while with the other eye he looks into a small fluoroscope and sees shadows cast by dense tissues, foreign bodies or instruments. Each eye is used alternately.

A RADIOACTIVE SUBSTANCE IN THE NAUHEIM SPRINGS.

Prof. Schott -- Munchen Med. Wochenschritt, June 28, 1904.

The sediments show a radio-activity of from 234 to 1,370, and the author says, just as before the ion theory made us understand better many an unexplained fact, so the study of the radio-active substances may bring light for the medical science in general and for the balneotherapy in particular.

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ON PAGETS DISEASE.

Jungmann and Pollitzer—Dermatologische Zeitschrift, June, 1904.

A case of Paget's Disease extending over a large area and having degenerated into carcinoma, was successfully treated with X-Rays after Holzknecht's method (but the author omits to give you the distance of the tube and the degree of vacuum). After two weeks a reaction of the first degree appeared, then the tumors in the axillary region decreased. The ulcerations were covered with healthy skin, the mobility of the upper arm became more free and the general condition of the patient, a woman of 46, improved.

THE INFLUENCE OF DAYLIGHT IN THE PROGRESS OF MALARIA.

Gunni Busck—American Journal of the Medical Sciences, July, 1904.

This article is a criticism of recent articles by Dr. A. F. A. King, who put forward the hypothesis twenty years ago that malaria was transmitted by mosquitoes. In Dr. King's recent articles he advocates placing malarial patients in the dark or in rooms with violet or purple window hangings. Sporulation of the plasmodium of malaria cannot take place in the dark, but only in light and more especially red light; in other words, treating cases by a negative phototherapy similar to the red light or Finsen treatment of smallpox.

King bases his conclusions upon the following experiments by Harrington and Leaming on the effect of light upon amoeba proteus, viz.:

"1. Amoeba streams in the presence of red light.

"2. Streaming is retarded, stopped, or reversed by rays from the violet end of the spectrum.

"3. Further, the effectiveness of the following kinds of light as inhibitors of protoplasmic flow diminishes in the order named: white, violet, red.

"From these experiments King draws the conclusions that red light promotes the vital processes of the amoeba, while violet light retards them; and as plasmodium malariae is a naked amoeba, he infers that the same thing applies to the latter.

"Harrington and Leaming, however, distinctly point out in their essay that the streaming of protoplasm in the amoeba is again continued after remaining a few minutes in any quality of light, and the point seems, consequently, to be the sudden change of light."

Busck does not consider that the experiments of Harrington and Leaming taken as a whole are conclusive in favor of King's views. More especially as Dreyer's experiments do not confirm King's conclusions with regard to the effect of red light upon amoebia. The fact that malarial paroxysms appear as a rule in the day-time might be construed as indicating that day light in some way or another is able to influence sporulation processes. The fact that negroes are less frequently attacked by malaria than white men, which King attributes to the dark color of their skin, which hinders the passage of light, can hardly be considered due to this factor, as the skin of the white man is usually covered with clothing which is practically impenetrable to light and may be considered equivalent

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to the dark skin of the negroes. King put forward the following hypothesis: "The red blood corpuscles in which the plasmodiae live gradually increase in size so that some of them are at length retained in the capillaries of the skin, where sporulation is then brought about under the influence of daylight. The fever paroxysm which accompanies this process is followed by the sweating stage, during which the blood vessels of the skin are dilated, whereby the blood corpuscles therein retained are released and the new generation of plasmodia is distributed to the other organs of the body." He considers the efficiency of drugs in the treatment of malaria to be due to "Their ability to alter the optical peculiarities of the blood; some of them (Prussian blue, methylene blue) so color the blood that the rays of red light are kept away from the plasmodiae, while others (quinine, esculin, fraxin) have the peculiarity in common of being fluorescent, and thereby *accentuating* the violet rays of the spectrum in the blood."

For treatment he recommends: "Keep malarial patients in dark rooms or in rooms with violet or purple windows; clothe them with garments impenetrable to light. Give the patients such remedies as render the blood dark or violet or lessen its translucency."

Busck considers that the special power of quinine upon malarial patients consists of the power of the quinine to render the plasmodium photosensitive, so that the latter will be weakened and destroyed under the effect of the daylight.

Some of his reasons for so believing are:

"1. The special effect of quinine in malaria can hardly be explained as a direct outcome of its toxicity with regard to plasmodiæ, although this undoubtedly is very considerable, and if we look for an explanation of this effect we must not leave out of consideration a peculiarity so distinct as the power to make micro-organisms sensitive in relation to light.

"2. Quinine preparations have decided sensitiveness-arousing qualities. Ullmann's investigations show, for instance, that paramæciæ, which are placed in solutions of quinine of 1:20,000, first die after about five hours standing in the dark, while they are killed in the course of eight minutes if placed in sunlight, under conditions which generally have no baneful effect upon paramæciæ.

"3. According to Jacobson's and Dreyer's experiments light, even after having passed through a layer of animal tissue can exercise its microbicidal effect upon the sensitive-made organs. The depth to which it may be possible to obtain an effect will, of course, among other things, depend upon the intensity of the light."

Busck hopes that experiments will be instituted in malarial districts whereby his belief "That daylight can increase the favorable effect of quinine preparations upon malarial patients" can be tested.

TREATMENT OF HAEMORRHOIDS AND ALLIED CONDITIONS BY OSCILLATORY CURRENTS OF HIGH TENSION.

T. J. Bokenham—London Lancet, July 2, 1904.

The method of application of high frequency currents preferred by Bokenham is by means of a glass vacuum electrode with the vacuum sufficiently high

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so that X-Rays are abundantly produced, the electrode being long enough to pass clear through both sphincters, and large enough to so distend the parts that its surface can come into intimate contact with every portion of the area to be treated. He uses from 100 to 150 milliamperes with these electrodes as determined by a hot wire ammeter. The duration of application is from 5 to 15 minutes; intervals between applications not stated.

During the past two and one-half years he has used the treatment in over one hundred cases of rectal trouble of varying degrees of severity, as follows:

Thirteen simple fissures of the anus were entirely cured with from 5 to 8 applications; the relief of sphincter spasm was an immediate and almost constant result.

Twenty-five cases of acute and recent capillary piles 14 of which were entirely cured and 9 greatly relieved, with from 4 to 11 applications; treatment was abandoned in 2 cases.

Thirty-one recurrent cases of internal and external piles without marked hypertrophic changes; 6 were cured, 20 were greatly relieved and 5 were improved. The number of applications varied from 9 to 18.

Improvement in all these cases commenced almost at once and the almost invariably-associated constipation was diminished along with the relief of the local trouble.

Twelve chronic cases with thickened irritable folds of skin but without marked venous conjestion; none were cured, 6 were greatly relieved and 6 were somewhat improved. Number of applications varied from 7 to 15.

Sixteen cases of large venous internal and external piles; 7 were improved and 9 were not improved. Number of applications given varied from 12 to 30; 2 were cases of recurrence after operation and the others all were complicated with chronic gastro-intestinal disorders.

Six cases of post-partum hæmorrhoids which were really instances of partial rectal prolapse with feeble sphincter muscle; 4 of these cases were cured, and 2 were greatly relieved. Number of applications varied from 8 to 19. General effect on the patient was quite noticeable.

Fifteen cases of pruritus ani with moist eczematous condition of the parts; all of these cases were cured with from 4 to 7 applications.

The results in these cases go to confirm what is pretty generally admitted, namely, that high frequency currents are strikingly and quickly successful in removing fissure of the anus and pruritus ani associated with hæmorrhoidal conditions; that treatment of piles is most efficient in early cases which do not exhibit excessive hyperplasia and produces less certain results where acute inflammatory conditions exist. In cases of old standing accompanied by much hyperplasia the results can rarely be obtained without long perseverance.

Bokenham considers the method far superior to any other except operation and cautions against omission to treat hepatic and gastro-intestinal troubles which may be the exciting cause of hæmorrhoids.

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THE PRESENT POSITION OF RADIUM IN THERAPEUTICS; WITH A SUMMARY OF THE FINSEN LIGHT AND X-RAY TREATMENT.

C. M. O'Brien—British Medical Journal, London, July 23, 1904.

Three cases of lupus that had been exhibited two years previously as apparently cured by X-Rays and the Finsen light are noted as having suffered no relapse; one case in which the disease had originally involved the alæ nasi, tip and bridge of nose, prominences of both cheeks, the greater part of the upper lip, and the nasal cavity, and which had been apparently cured, had suffered a recurrence in the mucous membrane of the nasal cavity and is now being treated by the high frequency current. O'Brien believes in combining the X-Ray and Finsen light in the treatment of many cases but does not believe it possible at present to select positively at the beginning which cases should be so treated.

Two cases of lupus treated by radium are reported. The first was a patch the size of a sixpence situated over the right eyebrow; 5 mg. of radium bromide (radio-activity not stated) enclosed in a vulcanite capsule, with mica window for easy transmission of rays, was placed in close apposition to the sore 20 times during 25 days for ten minutes each time. Applications then discontinued, "and three weeks later, the patch, although still red, had assumed the appearance of a healthy scar." The second case was a patch the size of a sixpence of 7 years' duration, location not stated. Sixty-one applications of the same radium used in case 1 were made, for from 10 to 60 minutes each, extending over a period of 8 months, at the end of which time "the base of the ulcer was clean and healthy looking, but the edges somewhat raised."

O'Brien concludes that to be practicable as a therapeutic agent, radium must be available in much larger quantity and at much lower price; that radium will probably never be of use in diagnosis; and that the Finsen light has no equal as a treatment for circumscribed superficial lupus.

SOME RESULTS OF TREATMENT BY X-RAYS, HIGH FREQUENCY CURRENTS AND ULTRA-VIOLET RAYS.

J. Alfred Codd—British Medical Journal, London, July 23, 1904.

Thirteen cases of lupus, rodent ulcer, epithelioma, carcinoma, etc., treated by X-Rays and high frequency currents, are reported, one of which, an extensive epithelioma of the lip, is particularly worth noting, a cure being the result of 25 X-Ray applications of an average duration of 12 minutes each. Below are the results which he has secured by the use of the high frequency currents: 2 cases of diabetes mellitus were given 25 and 18 sittings respectively; both were greatly benefited but the first has since relapsed; 2 cases of tinnitus aurium, 10 and 2 seances respectively, both cured; 2 cases anorexia nervosa, 1 cured by 3 seances, and the other suspended treatment prematurely; 3 cases of refractory sciatica, 2 cured by 9 and 12 seances respectively and 1 suspended treatment prematurely; 3 cases of refractory lumbago, 1 was cured by 15 sittings, the other 2 suspended treatment prematurely; 2 cases of tic douloureaux cured by 5 and 31 seances respectively; 1 case pruritus ani cured by 10 sittings; 3 cases of cephalic

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nueralgia, 2 were cured by 5 and 9 applications respectively and 1 suspended treatment prematurely; 1 case of hemianesthesia relieved considerably by 13 seances; 2 cases of hæmorrhagic piles cured by 2 and 4 seances respectively. In 1 case of recurrent lupus erythematosus and eczema, 12 seances cured the lupus and relieved the eczema considerably.

THE RADIANT LIGHT BATH IN THE TREATMENT OF NEUROSES.

T. D. Crothers—New York Medical Journal and Philadelphia Medical Journal, July 23, 1904.

The apparatus used by Crothers consists of a small room the walls of which are covered with incandescent lights, the reflecting power being intensified by a lining of tin. Crothers has studied the comparative effects of the Turkish and the incandescent light bath and finds that, in cases of neurasthenia due both to alcoholic and drug addiction and from over exertion, the effects of the electric light bath are to be preferred to the Turkish bath, both on account of the sensation produced in the patient and its physiological action. The arterial tension invariably fell after the use of the incandescent bath but did not always change under the influence of the Turkish bath, unless the time of using it was prolonged. A sensation of acceleration followed by a sensation of quietude, followed the incandescent bath, while many patients complained of exhaustion and headache following the Turkish bath. He believes that the physiological action of the radiant light bath depends upon the transformation of the heat and chemical rays into heat and chemical energy by coming in contact with substances in the body which offer resistance to its passage.

The skin is a poor conductor of heat but a good conductor of light, thus in the deeper tissues, light becomes changed into heat. The majority of patients felt that they received more benefit from the incandescnt bath than from the Turkish bath and five cases are cited most of them neurasthenia due to alcoholic and drug addiction in which most satisfactory results were obtained by the use of it. The case of one patient is mentioned who had been under very thorough electrical treatment by an eminent electro-therapeutist for painful insomnia for which he had used many narcotic drugs. The incandescent light bath given with douches before and after its application completely changed his condition and he became restored practically to entire health. He is still using the bath once a week.

Crothers draws the following conclusions:

"1. Radiant light penetrating to the deeper tissues of the body are turned into heat and transformed into nerve energy more positively than that of heat from the Turkish bath.

"2. The clinical effects of the bath prove its power as the eliminating agent and a corrector of neurotic, nutrient and capillary disturbances.

"3. In neurotic diseases its action in conjunction with other measures is far superior to any of these means when used alone.

"4. The evidence so far points unmistakably to the possibilities that when used in connection with other electrotherapeutic measures it may come into gen-

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eral use and constitute a real advance in the progress of neurological therapeutics."

THE RED LIGHT TREATMENT OF SMALLPOX.

J. F. Ricketts and J. S. Byles—London Lancet, July 30, 1904.

Thirteen cases are cited which were treated in a room from which every kind of light except red light was absolutely excluded. No candles or other naked flames were permitted artificial light being secured by the use of dark room lanterns with red glass. Five were vaccinated six were not. Two died during the fever of suppuration and in none were there observed any evidences that the method was capable of modifying favorably in any degree the clinical course of the disease except, that eye complications were not as severe as usual. Suppuration of the papules, scarring, etc., obtained just as with the patients who were treated in ordinary daylight.

From a careful study of all the cases reported upon so far by all observers it is considered that no conclusive evidence is available that the red light treatment produces any beneficial influence upon the course of the disease. The apparent lessening of the mortality reported by some observers is fallacious and probably due to variations in the severity of the infection, vaccination, etc. The mortality from smallpox in London in 1902 under ordinary treatment was over 17 per cent; in 1903 it was less than 4 per cent, showing the extent of natural variation.

From their experience with the thirteen cases cited above, Ricketts and Byles derived "the very unpleasant impression that the effect of the treatment was harmful. We thought that it had an unfavorable effect on the general condition of the patient. The tendency to mental symptoms (delirium, headache, restlessness, etc.) seemed more marked. The suppuration fever, too, seemed to us to range higher than might have been expected. It is true that we found the patients did well in respect to affections of the eye. That was to be expected. But, on the other hand, we thought that they had more than their fair share of the other sepic sequelæ of smallpox."

Some of the bad effects might have been attributed to the gloom and color of the ward but there were also other unfavorable features. "Not only was it difficult to keep a close watch on the development and progress of the eruption and on the patient's condition, but it was difficult to carry out those personal and general hygienic measures on which the successful treatment of smallpox so much depends. Above all, in excluding light, we must necessarily limit the supply of air. In all suppurative conditions and especially in smallpox, not only an abundant air space and good ventilation, but the freest circulation of air is essential. Any form of treatment which puts a check on the supply of fresh air must be regarded with suspicion unless it brings advantages in compensation. That substantial advantages do not attach to this form of treatment we feel sure. We therefore hope that this paper may have the effect of discouraging further applications of the remedy in this country. But we venture to appeal

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also to Dr. Finsen, who has done so much for suffering humanity, to cease to lend the weight of his authority to support a method which, if it is inefficacious, must necessarily be inhumane."

MERCURIC CATAPHORESIS.

Amedee Granger—New Orleans Medical and Surgical Journal, August, 1904.

Mercuric cataphoresis was first used by Dr. G. Betton Massey of Philadelphia in 1893. By this term is meant the cataphoric diffusion into malignant tissues of the products of electrolysis. The electrodes are made of zinc of various shapes and sizes to suit the part affected and are coated with mercury. By the electrolytic action of the current, the body fluids are decomposed, the acid ions going to the positive pole and the basic ions to the negative pole. The positive pole is the active pole; the active acid ions attack the amalgamated zinc electrode, forming oxychlorides of zinc and mercury, which are highly germicidal salts. These nascent salts are driven by the cataphoric power of the current along the most cellular paths containing the cancer cells. In their passage they unite with the albumen of the cells forming dead albuminates. Far beyond the zone of destruction, there forms in a few days a puffy, reddened zone of sterilization, in which the diffused chemicals have been deposited in sufficient strength to destroy the cancer cells but not the healthy tissue. The cancerous tissues being embryonal in formation, are more cellular and therefore become paths of least resistance to the electric currents; secondly, the cancer cells, being embryonal and lowly organized cells, succumb more readily to the action of the diffused chemicals than the healthy cells. The following cases are reported:

An epithelioma of the lower eyelid. Patient had been under the treatment of various physicians for four years. The ulcer gradually grew larger with great pain, involving four-fifths of the lower eyelid of right eye. The treatment consisted in three cataphoric mercurial applications under local anaesthesia. The unhealthy tissues were completely eradicated and the resulting space filled up with healthy granulations with astonishing rapidity. The lid has now healed with practically no deformity.

The second patient was referred by Dr. Sauter for epithelioma of the tongue. Five years ago this patient noticed a small ulcerated nodule the size of a pea caused by a jagged tooth. This slowly increased in size becoming painful with occasional hemorrhages. January 29th, 1904, a major application of mercuric cataphoresis under general anaesthesia was made. Strength of current averaged 150 milliamperes. The necrosed tissue came away the tenth day and a complete cure resulted.

The third case was one of inoperable sarcoma of the neck. In December, 1901, the tumor was as large as a goose egg and on the fifteenth of the same month the growth was cut out under general anaesthesia. Recurrence took place and patient was again operated upon in May, 1902. Recurrence again ensued and in 1903 the X-Rays were unsuccessfully used. February 15th, 1904, the first major cataphoresic application under general anaesthesia was made. The

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second application was made February 24th, 1904. The third application was made March 30th, 1904. The current strength used was from 160 to 300 milliamperes. The process of healing is now well advanced and there is every prospect of recovery.

A careful study of these cases teaches that mercuric cataphoresis constitutes a valuable means by which we can safely destroy a malignant growth, and also sterilize the parts around it.

A STUDY OF ELECTRICAL INJURIES.

H. L. Staples—Northwestern Lancet, August 1, 1904.

Electrical injuries are of three varieties: 1, burns of greater or less severity; 2, almost instant death; 3, psychical and functional disorders. The location of burns is most frequently on the hands, wrists, forearms, feet and legs, and these vary greatly in intensity, being always more severe than apparent upon examination; the slight blister may develop sloughing to the bone. The burn is at first dry and aseptic later the symptoms of moist gangrene may appear; pain is often severe. The treatment should be surgical, and skin grafting and amputation may become necessary; blisters must be opened immediately otherwise the rapid accumulation of serum under the skin causes great pain. Flesh burns and injuries to the eyes by exposure to the intense light, produce photophobia, conjunctival hyperaemia and profuse lachrymation. In no such cases has Staples seen or heard of permanent injury following. Treatment should include cocaine, boric acid and smoked glasses. Persons receiving a voltage of 1000 or over may be killed almost instantly while recovery may follow from 40000; various factors, such as dryness or the reverse of the skin, direction of the current, etc., constituting the difference in the results of contact with the current. Dr. Bailey of New York believes that "death by electricity is due to paralysis of the intrinsic nerves of the heart. I doubt if these changes would be sufficient to permit their recognition as such after death. The nervous system shows generally no post-mortem evidence which is pathognomonic."

Treatment of apparent death from electricity consists of surrounding the body with hot water bottles, the administration of strychnia, hyperdermically, 1/30 grain, and artificial respiration for a long time, the tongue being siezed with a handkerchief and rhythmical traction applied. Massage may be applied to the chest over the heart and all efforts should be maintained for several hours before abandoned. Many cases of death are attributed to electricity which are actually due to fright and chronic previously-unsuspected myocarditis.

Staples does not consider that electrical injuries are capable of producing persistent neuroses if the patient's mental condition is influenced in a hopeful way while he is being treated for the actual injury. He says: "Inform the patient that he is not harmed in the least, except by evident burns or bruises, and he will promptly recover. Prolong litigation two or three years, and the man is very likely ruined. If he recovers a remuneration it frequently does not com-

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pensate him for the time lost while if nothing is obtained after years of waiting, thinking, aching, examining, drugging, dyspepsia, and constipation, he is often damned beyond all hope of full recovery. It is usually in the power of the intelligent physician to prevent the development of this condition."

USE OF SERIES SPARK-GAPS FOR X-RAY WORK.

B. L. Weiss—Medical Record, August 6, 1904.

Great advancement has been made in radiography due to improved technique. This is shown by the skiagraphs made nine years ago necessitating an exposure of two hours, as compared with those of to-day made in as many seconds. The large induction coil excels every other form of apparatus used to energize the Crookes tube. For the more difficult work of photographing the shoulder, hip, pelvis, or foreign bodies in the kidney or the bladder or the gall-bladder, a coil having a spark capacity of from 12 to 18 inches is necessary.

We have difficulty to-day in obtaining tubes that will withstand the heavy output of the modern coil, for more than one-half to one minute, when the current is carried direct from the terminals of the coil to those of the tube. Besides destroying the vacuum of the tube, the inverse discharge quickly blackens the glass even in so short a time as one minute.

This can be prevented by placing spark-gaps in series with the terminals of the coil and those of the tube. The radiograph is also much improved and the time of exposure shortened.

The time of exposure necessary for good pictures with and without spark-gaps for the various parts of the body, with a subject of 150 pounds, with the same amount of current, the same X-Ray plates, and developers, the same tube and the same apparatus was as follows:

	With gaps.	Without gaps.
Hand	1 second	6 seconds
Elbow	1 second	15 seconds
Shoulder	10 seconds	35 seconds
Knee	6 seconds	30 seconds
Hip	45 seconds	90 seconds

Description of the Gaps: "The most convenient way is to mount these spark-gaps on a wooden rod about two feet long, and put one gap arrangement on each end. By means of a clamp, the wooden rod can be attached to any X-Ray stand. On each end of this wooden rod, I have mounted a piece of hard rubber about one-quarter of an inch thick and five inches in length; and on this hard rubber about four inches apart from one another are two upright metal posts which are respectively three inches high. A sliding rod at each end makes the sparking distance adjustable."

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ILLUSTRATIVE CASES OF MYELOGENOUS LEUKEMIA; PRELIMINARY REPORT.

George B. Evans—American Medicine, August 13, 1904.

Three cases are reported, two of which were treated with Roentgen radiations and one was not. The last-mentioned patient died nine days after coming under Dr. Evans' observation. One of the others was a woman, twenty-nine years of age who exhibited general weakness which had been growing worse for a year past, and a swelling in the abdomen occupying the left superior and inferior and right inferior quadrants. Splenic dulness extended up to the seventh rib and a dull mass continuous with the splenic dulness extended to a distance of seven cm. below a transverse line drawn through the umbilicus and six cm. to the right of the median line. This mass was tender on palpation. Liver not enlarged. Blood examination shows red cells 4,200,000, hemoglobin 60 per cent, leukocytes 240,000, of which 70 per cent were polymorphonuclear neutrophiles, 8 per cent lymphocytes, 20 per cent myelocytes, and 2 per cent were eosinophiles, two nucleated red cells were seen; no poikilocytosis. Fowler's solution in increasing doses was prescribed and ten days after the Roentgen radiation was begun; the splenic tumor being exposed to rays from a medium high vacuum tube at an average distance of ten inches (whether this referred to the anode or the glass wall of the tube is not stated) for from fifteen to twenty minutes daily. After six treatments the mass had decreased two cm. in its transverse measurement and the leukocytes had decreased to 132,000. On November 5th, she had febrile movement and chills from which she recovered in three or four days. Fowler's solution was discontinued at this time and the Roentgen ray treatment resumed after a lapse of ten days. On February 11th the leukocytes were 77,000, myelocytes 15 per cent, many of them having a large indented nucleus, eosinophiles 4 per cent, some of which were eosinophilic myelocytes. There was no change in the number of red cells. Spleen extended only to the median line and six cm. below the umbilical line in the left inferior quadrant. On March 11th the red cells had decreased to 3,500,000, leukocytes had increased to 117,500, polymorphonuclears 58 per cent, small lymphocytes 3 per cent, large lymphocytes 5 per cent, myelocytes 33 per cent, and a few nucleated red cells. At this time for two weeks patient had chills, headache, loss of appetite, etc., and treatment which for several seances past had been given with a low tube, was suspended for a time. Spleen had increased so that it extended four cm. to the right of the median line and eight and one-half cm. below the umbilicus at its lowest point; an increase in size over that exhibited at the last observation. Evans thinks this may have been due to the fact that the rays from the low vacuum tube did not get into the substance of the spleen and applications with a high tube were resumed on March 19th, which have been kept up until the present time. On April 1st, a blood examination showed 3,680,000 red cells, hemoglobin 70 per cent, leukocytes 88,000, polymorphonuclears 64 per cent, small lymphocytes 5 per cent, large lymphocytes 4 per cent, myelocytes 21 per cent, transitionals 4 per cent, eosinophiles 2 per cent, an occasional nucleated red cell was seen. The spleen was

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felt in the median line and five cm. below the umbilical line. Patient felt well and her appetite and general condition were good. From October 19th, 1903, to April 1st, 1904, she had received one hundred and twenty-five radiations, averaging seventeen and one-half minutes each.

The other case was a man sixty years old who came under observation December 22nd, 1903, and who had been suffering from a gradually increasing general weakness, slight edema of the ankles and fullness and discomfort in the epigastric region, for fifteen months. Blood examination showed red cells 2,450,000, hemoglobin 50 per cent, and leukocytes 250,000, of which 51 per cent were polymorphonuclear neutrophiles, 4 per cent were small lymphocytes, 3 per cent were large lymphocytes, 38 per cent were myelocytes, and 4 per cent were eosinophiles. He was given Fowler's solution and Blaud's pills until January 17th, 1904, when these medicines were discontinued. March 13th, the blood count showed 3,600,000 red cells, hemoglobin 80 per cent, leukocytes 12,600, polymorphonuclears 62 per cent, small lymphocytes 20 per cent, large lymphocytes 4 per cent, myelocytes 12 per cent, eosinophiles 2 per cent, and the Roentgen ray treatments of which he had received sixty-one since December, were discontinued. These radiations had all been applied with a medium high tube at an average distance of ten and one-half inches from fifteen to twenty minutes. "After the thirty-sixth treatment the spleen disappeared beneath the costal margin and by the forty-fifth treatment was normal in size and position. The liver had also decreased. He began to improve in his general condition from the beginning of treatment and the edema had entirely disappeared by the fourth week. His appetite has improved, his digestion is good, he sleeps well and has had a gradual return of strength. At the present time he is able to return to his business, and claims to be stronger than at any time for the last two years." Evans regards this case as symptomatically cured and case 1 as greatly improved. Although the red cells have not greatly improved as regards number, in case 1 there having been an actual decrease, yet the hemoglobin ratio was decidedly improved. Evans believes that we should be cautious in pronouncing cases cured that have apparently cleared up under the Roentgen rays and also apparently believes that the number of results that have been recorded, while not many, are enough to indicate that the Roentgen rays are capable of exercising a very markedly beneficial influence over the progress of myelogenous leukemia.

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Current Electrology and Radiology

(Only articles relating to the above-named subjects will be abstracted.)

JOURNAL OF ADVANCED THERAPEUTICS.

New York, August, 1904.

1. Electricity in the Treatment of Diseases--Charles Henry Shepard.
2. The Radiant-Light Bath in the Treatment of Neuroses—T. D. Crothers.
3. Problems in Electro-Therapeutic Practice — Propounded at the Thirteenth Annual Convention of the American Electro-Therapeutic Association, September, 1903.
4. High Potential Currents and Currents of High Frequency--William Benham Snow.
5. Vibrations and Nerve Vibrations without the Medium of Machines, Their Technique and Therapeutic Value in Acute and Chronic Diseases—R. Strensch.

1. Twenty years' experience with the electro-thermal baths leads Shepard to conclude that electricity is a powerful factor in the treatment of disease. While inexperienced operators may sometimes succeed in securing surprising results, yet as the laws governing the therapeutical application of electricity are inflexible and invariable, the expert who thoroughly understands these laws secures more uniform and positive results than he who does not understand them. Most disease conditions are initiated by an overloaded and overworked nutritive system. Electricity is a "vitalizer of the highest order, and has the power of quickening the nervous system in any part of the body," hence when the nervous system is overworked the soothing and vivifying influence of electricity is indicated, the effect of the same being greatly intensified if the electrical application is preceded or accompanied by a hot air treatment. It is particularly valuable in neurasthenic and the so-called rheumatic conditions and to illustrate its beneficial action, cases of intestinal congestion, paralysis from dissipation, acute and chronic rheumatism and sciatica, in which it was effectually applied are cited.

2. See under Miscellaneous Abstracts.

3. Dr. C. R. Dickson asked regarding the probability of producing an artificial menopause when raying the abdomen for uterine fibroids. The discussion upon this point was meagre and not decisive.

Dr. W. P. Spring asked regarding the effect of the use of the fluoroscope on the sight of the operator, the fact being brought out that some men had had their eyesight badly damaged in this way. Dr. Spring and others had used a piece of thick glass, which was placed between the eyes of the operator and the fluoroscopic screen. As lead glass is particularly opaque to the X-Rays and at the same time transparent to ordinary light, this would prevent a large proportion of the rays from reaching the operator's eyes, at the same time the study of the image on the screen would not be interfered with. It was considered probable that a piece of glass applied to the back of the fluoroscopic screen or a pair of spectacles made of heavy glass and used during fluoroscopy would be effective in preventing such injury to the operator's eyesight.

Dr. G. B. Massey gave a practical demonstration of his method of applying

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zinc-mercuric cataphoresis to tubercular glands. If the gland was not open, the skin should be anesthetized and punctured with a Hagedorn needle. A sliver of zinc amalgamated with mercury and connected with the positive pole of the continuous current should be inserted into the puncture and a current of from one-half to three milliamperes turned on for half an hour. A drop of saturated solution of cocaine dropped in alongside of the zinc sliver would do away with the pain. A mass of necrosed tissue comes away from the gland in a few days and the treatment may then be repeated through this opening by means of the insulated zinc electrode. The gland becomes so impregnated with mercury that it drains downward and favorably affects other glands in the chain. The active agency in the cure of these infections is the chloride of zinc and mercury, which is carried into the tissues by means of cataphoresis. Dr. Massey has used the method upon six patients, two of whom were exhibited.

Dr. A. C. Geyser was in the habit of preserving in a proper scrap book all articles dealing with electro-therapy that he could find in current periodicals, and suggested this as a most valuable way of keeping in touch with electro-therapeutical literature.

4. Snow appears to include in the term "High Frequency Currents" those derived directly from the poles of the static machine as well as those derived from the various high frequency transformers, calling them "Static currents of high frequency." This is unfortunate and apt to be misleading to those readers who are not acquainted with the physical characteristics of the electrical currents of high potential. Whereas the static current is literally *a high frequency* current yet it is not *the* high frequency current in the sense in which this term is commonly used. To avoid confusion, therefore, it would be better to use the word *direct* static current to denominate those discharges which are derived immediately from the poles of the static machine and confine the term *high frequency* to those modalities which are produced only by the interposition of the Leyden jars in connection with solenoid, coil, or spiral, between the primary source of energy and the patient.

The physiological effects of currents of high potential are "divided into three classes: (1) the electrical effects, which are due to the action of currents of high potential and small quantity; (2) the derived mechanical effects; and (3) the antiseptic or antizymotic effect of discharges upon superficial tissues." The first is stated to consist of "the induction of muscular contraction of a character not dependent upon the stimulation of motor points" and is constituted by intense fibrillary contractions of the muscular structures and the muscular coats of the vascular systems of the regions involved; the second induces an increase of local metabolism, which acting with the muscular contractions overcomes "Infiltrations or local stasis," thereby relieving areas of congestion which render chronic processes unresponsive to drug medication. (The distinction between these two is not made clear.) The third is secured by the use of the spray, brush discharge, or glass vacuum electrode, is useful in superficial conditions of the skin and mucous membrane associated with germ proliferation, and depends upon the formation of nitrous acid and ozone at the point of impingement.

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With reference to therapeusis Snow divided the high potential currents into high potential currents of low or regulated frequency (static wave current and the like), and high potential currents of high frequency (D'Arsonvalization and hyperstatic). He considers the former best adapted to the treatment of inflammatory affections, errors of general metabolism, and other spasmodic conditions, and the latter to the treatment of various superficial affections and some types of septic and tubercular disease. He claims results for the static wave current in cases of acute neuritis, acute sciatica, and acute tic douloureaux, which as far as we know, have not been duplicated by any other clinician or any other method. In rheumatoid arthritis and sprains, gratifying results are to be expected. He believes that acute inflammatory processes tending toward abscess, suppurative tonsilitis, felons, carbuncles, etc., can invariably be cut short by the various high potential modalities if suppuration has not already obtained. In anterior polio-myelitis, locomotor ataxia, Bright's disease, acute inflammatory joint affections, metrorrhagia, and sub-involution, results are most gratifying if the condition is uncomplicated. With the two last-mentioned the vaginal vacuum electrode should be used and the opposite pole grounded. He believes in vaginismus valuable results may be expected from the employment of this modality. Snow concludes "that the currents of high potential and moderate frequency, associated with the production of muscular contraction, are the currents best calculated for the treatment of local inflammatory conditions and influence upon general metabolism, while the currents of high potential and great frequency are better suited to the treatment of superficial conditions and localized septic processes."

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ARCHIVES OF THE ROENTGEN RAY.

London, England, June 1904.

1. Lecture to Medical Practitioners on Physics Applied to Medicine, Lecture 4, Medical Applications of the Rays—Sir Oliver Lodge.
2. High Frequency Currents; Some Infective Diseases Amenable to Treatment—(To be continued) Clarence A. Wright.
3. The Roentgen Society; Its Past Work and Future Prospects—J. J. Vezey.
4. Some Experiments with Alpha Rays Giving Luminous Effects Direct from Pitchblende—F. H. Glew.
5. The Roentgen Rays—Herschell L. Harris.

1. This lecture treats particularly of that portion of radiation which in the normal spectrum is located beyond the violet end of the band and known to the profession as "ultra-violet light." It is interesting to note that the author favors the old Young-Helmholtz theory of color blindness, though considerable opposition has lately been offered by the best authorities on experimental psychology. It is my opinion that physicists generally have held to the older view. The cause of dispersion as based on the relative sizes of ether waves and of atoms of matter is most clear, as well as the reason given for the non-refraction of X-Rays. (In Fig. 21 there is an obvious error in the designation of the rays; the short ones clearly represent the ultra-violet part.)

The impropriety in the terms "Actinic rays," "Heat rays," etc., is explained and should be more generally understood than it is.

The best ways of generating and not losing ultra-violet rays is made clear. They emanate only from a source of very high temperature, preferably iron terminals with a long electric arc between, and the optical instruments should be of quartz, as glass is rather opaque to these rays.

The ionizing effects of ultra-violet light and a brief explanation of the phenomena is given in the lecture as well as some very important distinctions between these rays and the X-Rays.

Dr. Finsen's work is spoken of and a few results given demonstrating the therapeutic value of this form of ether energy.

3. The Roentgen society held its first general meeting at the rooms of the Medical Society on Chandos street, Cavendish Square, on June 3d, 1897, under the presidency of Professor Silvanus Thompson. Its formal inauguration took place on November 5th, 1897. The objects of the society are the study of the nature of the X-Rays, practical inquiry as to the best apparatus for their production, and investigation of all details bearing upon their useful application. Sixty papers have been read before the society since its foundation in addition to its presidential addresses. In addition to these there have been exhibit meetings every year. The work of the society has been extensive and valuable and includes that of some of the best known physicians and physicists in England.

4. Some experiments on Alpha rays from various materials and Glew's descriptions of some simple ways of observing the scintillations produced by these rays are worthy of mention. The well known difficulties of actually seeing the spinthariscopic effects of polonium are met by viewing with a short focus lens a very thin layer of fluorescent material such as zinc sulphide spread on a thin disc of material translucent to the X-Rays, the emitting substance being

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brought close to the back of the disc. Under these conditions "the sparkling light appears on a perfectly dark background," no general luminosity from Beta or Gamma rays being present, these rays not being emitted by polonium.

"A similar arrangement can be used to show the scintillation by substances containing only traces of the active materials. A result was obtained even from a Welsbach mantle. A modification of the apparatus by which the disc may be rotated was used to get an approximate value of the duration of a scintillation. This was certainly less than 1/50,000 part of a second." The relative transparency of various substances to the Alpha rays can be directly studied by the method above outlined.

5. Harris has secured 50 positive diagnostic results out of 250 cases of suspected renal calculi, which he has skiagraphed. In two cases he diagnosticated calculi but they were not found upon operation. The day before skiagraphing for suspected renal calculi he has the patient thoroughly purged. He uses an accelerating screen and as soft a tube as possible, aiming to get distinct shadows of the ilia, the vertebrae, and the last two or three ribs. Harris has used the rays therapeutically for two years and is favorably impressed with their use in rodent ulcer, lupus erythematosus, lupus vulgaris, and keloid. In several cases of hypertrichosis the hairs fell out but returned later. (This, we believe, is ordinarily the case and that in order to secure a permanent result the hair must be killed at least three times.) In carcinoma of the breast he reports much benefit to the patient but no cures. One case of carcinoma of the rectum showed remarkable improvement as well as diminution in the size of the growth, but the patient died after a while from metastases in the liver. The results with epitheliomata have not been satisfactory. In one case of sarcoma the result is promising. He uses a coil to excite his tube and prefers to treat his patient daily. The distance of the anode from the patient's skin and time duration of the treatment is not stated. As regards the use of the X-Ray in carcinoma he says: "There is no doubt that the X-Ray may give very great relief in this condition. The patient's spirits are greatly raised, pain disappears, offensive discharges cease, and the ulcer heals. All of these conduce to the patient's comfort. The original growth, too, as a rule, diminishes and disappears. When, however, there is secondary involvement, the case progresses, and death ensues from such involvement. I think, however, that one can say that the life of the patient is generally prolonged in such cases and that his death is easier than it otherwise would have been."

ARCHIVES OF THE ROENTGEN RAY.

London, England, July, 1904.

1. Lectures to Medical Practitioners Applied to Physics: Lectures on High Frequency Currents—Sir Oliver Lodge.
2. Experiments to Determine the Effects of Form and Winding on Resonance Phenomena—Clarence A. Wright.
3. High Frequency Currents in the Treatment of Chilblains and Naevus—Margaret M. Sharpe.

1. This lecture treats, from a purely physical standpoint, of "High Frequency Currents," and is devoted chiefly to making clear that the so-called high

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frequency effects are due to the rapid oscillations of electric charges on bodies of sensible size, just as light, according to Maxwell's theory, is due to the oscillations of charges on atoms of matter. The only difference is in the size of the bodies holding the charges, the frequency of oscillation having been shown to be the greater the less the capacity of the conductor. A pair of Leyden jars with knobs brought within sparking distance and joined to an electric generator are used for illustration. The remarkable differences between the knob-discharge spark, A, and the B-spark which takes place between the outer coatings, are detailed, and attention called to the fact that the former is harmful and the latter not so. The comparison between mass-inertia and self-induction is referred to, and also is explained how the variation of the latter and hence of the frequency is effected by the size and shape of the conductor used. The various well-known experiments with the B-spark made first by the author several years ago, are described. They are called "The Experiment of the Alternation Path," "The Experiment of the Surging Circuit," and "The Experiment of the Recoil Kick." These form the basis of what is known as the high frequency treatment in medicine.

Statement is made that the applications are to be considered in detail in the next lecture.

2. When rapid oscillatory currents are present in an open electric circuit the phenomena are analogous to those of sound when so-called stationary waves are set up in an open organ pipe or in a stretched string. Assuming the circuit to be symmetrical, then there is a node at its middle point. If now the circuit be made asymmetrical by changing either the capacity or the self-induction in one half, the node will be shifted but can be found again by several well known methods described in the paper. If, however, both the self-induction and the capacity of either side be so changed that their product remains constant, the period of oscillation is not changed and the node will not move. In brief, then, the main purpose of the investigation was to determine the shape of the coil formed from a wire of given length and size that would introduce the maximum self-induction into one side of a balanced derived circuit. The balance was restored in either of two ways, viz., by an adjustment of the relative capacities on the two sides, or by shifting the connecting wire till contact was again made at the node.

Six symmetrically curved helices of different forms were examined, all made of 14 feet of hard drawn copper wire about 0.2 inches in diameter. The six forms were (a) cylindrical, (b) conical, (c) flat, (d) plano-convex, (e) plano-concave, (f) spherical, and (g) lenticular. From several series of measurements made by both methods, it was demonstrated beyond question that the maximum resonance was produced by the lenticular form. The least effected shape was shown to be the cylinder.

It seems as if the author was in error when he says, "Now, we well know that the vibration period of each arm is the product of the co-efficient of self-induction of that branch into the capacity at its end." The writer believes the true formula to be $T = 2\pi \sqrt{LC}$.

3. A patient who was being treated for the removal of disfiguring scars on

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her face and hands, the result of an accident with a pane of glass, developed a bad case of chilblains in the scar area. Five minutes' treatment with the high frequency current entirely removed the chilblains.

A naevus, situated upon the back of a baby 8 months old, between the angle of the right scapula and the spine, which was not discolored but seemed occasionally "to swell and get blue," was entirely removed after seven applications of the high frequency current of from five to eight minutes' duration each. Applications in each case were administered by means of the vacuum electrode exhausted to such a high degree that the passage of the current produced bright green fluorescence even in daylight; it gave off no sparks or brush discharge, did not heat and imparted no sensation whatever to the skin, which also did not redden under its application. It was held in contact with the skin, and in the last-mentioned case, some pressure was used.

LA RADIUM.

Paris, France, July, 1904.

1. **Radioactivity of Mineral Waters**—Albert Laborde.
2. **The Radiation of Radium**—L. Matout.
3. **Radiotherapy**—A. Beclere.
4. **A New Process for Manufacturing Platinocyanide of Barium**—J. Petit.

1. Mineral waters have been known to exhibit therapeutic powers for many years, descriptions of the same being found in the writings of the elder Pliny. Although the ancients knew of their value and nearly all ancient writers are of one accord as to their estimation of their beneficent power, yet they knew nothing of the reasons why such powers were exhibited and ascribed the good secured to beneficent influence of the Deity. In 1864 was first brought forward the theory that their influence might be electrical, but it was not until the discovery by Becquerel of radio-activity and later the work of Elster, Geitel, Curie, Himstedt, Rutherford, Ramsay, etc., who found that mineral waters exhibited radio-activity, that the idea was evolved that the healing power might be due to this source. The emanations of radium and also helium are found in water from various sources. The fact that helium is formed directly from radium is believed to indicate that radium as such exists in the deeper parts of the earth from which the water comes. The length of time which it would take the water to reach the surface would be sufficient for the emanations from radium to become diffused therein. It is stated, as an evidence that mineral waters may owe their healing properties largely to the presence of radio-activity, that the mineral waters which exhibit the greatest amount of radio-activity appear also to exhibit the greatest healing powers. In order to study the radio-active gasses which are found in mineral waters it is necessary that they should be most carefully collected so as not to have any air mixed with the gases which are to be studied, and the apparatus which is capable of doing this, together with the methods used in the process of collecting and studying the same, are detailed at considerable length.

2. Rays of radium are analogous with the rays from an excited Crookes

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tube, the Alpha rays correspond with the canal rays of Goldstein, the Beta rays to the kathode rays, and the Gamma rays to the X-Rays. The physical properties of the rays from radium, their behavior under the influence of electrical fields, magnetic stresses, phosphorescent bodies, etc., are described in detail.

3. Two cases of malignant disease are reported. The first was an epithelioma of the temporo-maxillary region as large as a silver dollar, of the fungoid type, the surface of which was raised up above the skin 1 cm. Thirteen applications of X-Rays of a moderately high degree of penetration (4 and 5 units, H, as measured by the Holzknecht chromoradiometer), for a period of ten minutes each, with the anode fifteen cm. from the surface of the growth, and extending over a period of three months, produced an entire disappearance of the growth and cure of the patient, without any dermatitis.

The second case was an osteo-sarcoma of the superior maxilla, recurrent after having been twice removed surgically during a period of three years. This patient was treated for eight months with X-Rays of a moderately high degree of penetration, applied to the tumor through the sound skin of the cheek which was unbroken and unulcerated, but the total number of applications is not stated. The treatment period was from three to six minutes, anode ten to fifteen cm. from the skin. Synchronously with the X-Ray treatments and half an hour before their application, were administered subcutaneously, 50 cgm. of the bichlorhydrate of quinine as recommended by Dr. Morton of New York. At the end of this course of treatment the malignant process had entirely disappeared and the patient was considered entirely cured. In both these cases the X-Ray tube was excited by a coil.

Beclere considers that the details of this case may fairly be considered as indicating that the quinine through its property of flourescing when subjected to the influence of the X-Ray may have been a factor in producing the cure but is not ready to commit himself positively upon this point without having observed more cases. The case is certainly very important, as the cure of a malignant process involving bony tissue by radiotherapy alone is at present almost, if not quite, an unparalleled event.

From these cases the conclusions are drawn that the elective and specific curative actions of the X-Rays are manifested against sarcoma as well as against epithelioma, and that these elective and specific influences may be exerted upon subcutaneous neoplasms without destruction of the overlying integument taking place.

JOURNAL DE PHYSIOTHERAPIE.

Paris, France, July, 1904.

1. Case of Low-Tension Pulse of Cardiac Origin, Ameliorated by Hydrotherapy—Dr. Pariset.
2. The Influence of the Mediterranean Climate Upon Rheumatism and Rheumatics—H. Triboulet.
3. Clinical Note on the Pelvo-Abdominal Syndrome in Women—M. F. DeRanse.
4. The Treatment of Tumors of the Stomach by Radiotherapy—Drs. Doumer et Lemoine.

4. Of twenty-one cases treated, three have been cured completely, a fourth is on the way to recovery, and a fifth, in whom a relapse occurred, is again under treatment. The other patients have followed a variable course.

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In case 1 the treatment caused the complete disappearance of the tumor in seven months and the cure has been complete for over a year. The second, a very severe case, was devoid of pain after the second treatment, and one month later there was no trace of the tumor. Recovery was complete. The third likewise went on to complete recovery. Most of the other patients failed to recover.

To generalize, the radiotherapy caused the painful symptoms to lessen on first treatment. Vomiting ceased and alimentation became possible. In certain cases the tumor disappeared completely, but in other cases reappeared in the same vicinity or in neighboring organs. Since the treatment seemed to exercise influence only on tumors situated superficially, the deep seated tumors, after a period of remission, due to the action of the radiotherapy, later generalized and ended rapidly in death. Secondary tumors had developed.

No doubt the tumors cured differ histologically from the tumors that did not yield to the treatment. On this point we can only form a hypothesis based on experience with tumors of the skin. Perhaps the epithelial tumors which develop from old ulcers are the ones which are permanently cured, while those of the carcinomatous type generalize.

ARCHIVES D'ELECTRICITE MEDICALE.

Bordeaux, France, July, 1904.

1. Report on Hydro-Electric Baths—J. Larat.
2. Treatment of Neuralgias by Quinine—S. Leduc.
3. Description of a New and Very Powerful Apparatus for the Production of X-Rays and High Frequency Currents made by M. Gaiffe of Paris.

1. Hydro-electric baths are divided by the author into the following classes: (a) general baths, including bipolar and monopolar; (b) local baths, including the four-celled baths of Schnie; and (c) electric douches.

Enamel is used as a coating for the interior of the bath, since it is readily insulated, and does not evoke the feeling of cold in rheumatics that marble or stone would. Inside of this there is a lining of caoutchouc. The best electrodes are made by soldering plates of copper together and hanging them inside the bath in such a way that they can be connected together to each other. Five generally suffice for all purposes. In placing them along the side of the bath it is possible very easily to diffuse or condense the lines of force of the current. The water ought to be as pure as possible. Salts increase its conductivity.

Experiments controlled by means of instruments of great precision show that the resistance of the human body immersed is a little greater than an equal volume of water. The quantity of electricity which traverses it is valued at perhaps 10 or 15 per cent of the total current. The writer uses galvanic currents, faradic, sinusoidal, polyphase; never the direct currents of dynamos.

In a monopolar application the patient is plunged into a monopolar bath, the other pole consisting of a moist sponge held in the hand.

For local baths Schnie employed four large tubs into which he plunged

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the arms and legs of the patient, a combiner permitting the flow of the electric current in every direction. To this Allard adds a fifth tub, in the form of a sitz bath.

The electric douche is difficult to construct. On account of this it is very little used.

The physiological effects of hydro-electric baths correspond to that secured from diverse modalities. The temperature of the water intensifies the action of the electricity. It permits of the introduction of large doses of medicinal substances. It is possible to expose large surfaces of skin to the action of iodine, sulphur, etc., in their nascent state. The bath renews the contractility of the musculature of the organism. It augments the energy and vitality of the cell and favors the absorption of exudates. Physiological fatigue is induced and insomnia thereby overcome. The appetite is increased.

The therapeutic indications for hydro-electric baths are (1) neuroses, neurasthenia, hysteria, insomnia; (2) nutritive troubles, obesity, rheumatism, subacute and chronic gout, the troubles of the menopause, dysmenorrhea, and the convalescent state. Excellent results are obtained in the cicatrization of torpid wounds and in chronic pleuritic effusions. It is excellent in certain affections of the skin, pruritus, eczema. The effects are good in affections of the heart, especially in hyposystole. They diminish oedema and promote the excretion of urine. They increase vasomotor tone.

The quantity of current varies from fifteen to thirty m. a. during fifteen to twenty minutes. The baths are contraindicated in degeneration of cardiac muscle.

Book Reviews.

ELECTRODIAGNOSIS AND ELECTROTHERAPEUTICS.

By Dr. Toby Cohn, Nerve Specialist of Berlin.

Translated from the Second German Edition and Edited by Francis A. Scratchley, M. D., of New York. With Eight Plates and Thirty-Nine Illustrations. Funk & Wagnalls Company. New York and London, 1904.

Dr. Scratchley has conferred a real service upon those who are interested in electrotherapy by translating Dr. Cohn's excellent work of 280 pages. It does not thoroughly cover the whole field of electrotherapy by any means, however, only that portion of it which is of interest to the neurologist being dwelt upon with anything like a satisfactory degree of fullness. The application of electricity in gynæcology surgery, etc., are hardly touched upon at all. It is divided into two parts, electrodiagnosis and electrotherapeutics. The first part occupies 157 pages and is the best exposition of the subject that we have ever seen, the rationale of electrodiagnosis being elucidated in a thoroughly exhaustive and most satisfactory manner. A prominent feature of this part of the work

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consists of the cuts illustrating the application of electricity to the investigation of muscle and nerve phenomena. The cut proper pictures the muscles and nerves supplying them and over this is pasted a piece of tissue upon which are indicated the points of greatest excitability of the nerves and muscles, thus making the application of the currents and their effects as plain as though the work was being illustrated on a cadaver.

In the second part, treating of electrotherapeutics, the various theories by which it has been attempted to account for the influence of electricity, namely, psychical theory, physical theory, chemical theory, etc., are discussed at length with the general rules which should guide the choice of currents and the strength and polarity of the same to different pathological conditions. Dr. Cohn believes that the psychical element in the benefit derivable from the application of electrotherapeutics is very considerable, but he also believes that the greater part of its influence is obtained by actual physical and chemical effects produced by the passage of the currents and that it is therefore a therapeutic element of positive inherent power. This is followed by a description of its application to different disease conditions in which it has been found valuable by the author.

A novel feature of the work is that very little of electro-physics is introduced and this only in the way of explanation of apparatus. Dr. Cohn very well says in his preface: "The fact has certainly become evident to me that students of medicine and physicians have in general an aversion to all mathematical explanations and technical discussions with which text books of electrotherapeutics usually begin." After about 30 pages, therefore, in which he elucidates most satisfactorily the mechanical points of the apparatus he enters at once into the application of the currents to diagnosis and treatment.

The last 60 pages of the book deal with new apparatus and some of the newer applications of electricity, high frequency currents, sinusoidal currents, the therapeutic use of fields of magnetic stress, etc.

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Original Contributions.

A LARGE FIBRO-SARCOMA TREATED BY ROENTGEN RADIATION.*

By Clarence Edward Skinner. M. D., LL. D.,

of New Haven, Conn.

Physician in charge of the Newhope Private Sanitarium, New Haven, Conn., etc.

Mr. Chairman and Gentlemen: Probably no one subject has ever excited a greater degree of interest in the minds of medical men than the discovery of the beneficent influence which the Roentgen ray exercises upon malignant disease. It has now been demonstrated thousands of times, it has been studied by hundreds of scientists, yet our positive knowledge of the rationale of this influence is still practically nil, and a large proportion of our colleagues are still skeptical as to whether such a power is actually inherent in the X-ray so as to be utilizable for the attainment of practical curative results. This is especially true with regard to deeply located malignant processes and we are obliged to admit that with regard to this particular class of cases, there is much to justify skepticism; the failures are much more numerous than the successes. Occasionally, however, a case is encountered in which effects of profound significance are observed, as regards both rationale of action and the demonstration of its curative power, and it is because of some striking clinical phenomena obtaining in the following case and bearing upon these points that I call it to your attention.

The patient was brought to me in January, 1902, from the Memorial Hospital of New York city, where she had been for some months under the care of Dr. W. B. Coley, whose description of the case up to that time, as it appears on page 767, Vol XXI., of the "Twentieth Century Practice of Medicine," is so succinct and complete that I quote from it as follows:

"M. J. H——, female, aged 34 years, was referred to me by Dr. Maurice H. Richardson of Boston, on April 19, 1901. The patient had a well-marked family history of malignant disease. She had been operated upon three years before for what was regarded as a fibroid tumor of the uterus; tubes and ovaries also were removed. No microscopical examination was made. Two months previously she had first noticed a hard tumor in the lower part of the abdominal wall in the region of the cicatrix. There was no pain, no discomfort, but rapid increase in size. When the patient came under my care, physical examination showed a

*Read before the Section on Electrotherapeutics of the International Electrical Congress, held in St. Louis, Mo., Sept. 12th to 17th, 1904.

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tumor, the size of a cocoanut, in the lower part of the abdomen, filling up the entire iliac fossa, extending nearly to the umbilicus, and two inches beyond the median line to the left. The tumor was very firmly fixed and seemed to involve the abdominal wall. An incision was made under cocaine and a portion of the growth, which infiltrated all the muscles of the abdominal wall, was removed for microscopical examination, which showed it to be fibro-sarcoma. The erysipelas toxins were used for ten months. During the first two months the growth decreased more than half in size, and for a long time thereafter, while there was no decrease, there was no distinct growth. Later on, the influence of the toxins seemed to have become lost, and there was a slow but gradual increase in size. In January, 1902, the tumor was growing rapidly, and at this time the abdomen had the appearance of that of a woman seven months pregnant."

Three points are established by Dr. Coley's description. First, that a large deeply located abdominal tumor was present, which was inoperable and malignant in the opinions of two of the ablest surgeons in the United States; second, that these opinions as to malignancy were confirmed by microscopical examination of excised portions of the tumor; third, that in spite of thoroughly applied treatment along approved lines, the tumor was rapidly growing and entirely beyond control.

The measurements of the tumor when I began to apply the X-rays in January, 1902, were 10 inches from side to side, at the level of the anterior superior spines of the ilia, 8 inches vertically in the median line, and about 5 inches antero-posteriorly in the median line. Estimation of the last-mentioned diameter is based, in addition to the gross appearances, upon observations made by Dr. Coley when the last excision for microscopical examination was done in December, 1901, the incision having been carried down to the peritoneum in the median line; I was assisted in the determination of the other two by Dr. C. A. Bevan of West Haven who brought the case to me and who has watched it most carefully throughout. The anterior surface of the mass was evenly convex, somewhat more prominent on the right side than on the left, of a stony hardness throughout, firmly adherent to the overlying skin and firmly adherent to the os publis. The patient weighed 128 lbs., was rapidly losing flesh, markedly cachectic, and so weak that the ascent of a flight of half a dozen stairs was an herculean task; she complained of sensations of pressure in the abdomen, and disturbance of the intestinal and bladder functions was present. In a word the general condition was bad and growing rapidly worse. Pain had never been present.

The X-ray applications were begun January 28, 1902, and were all administered by means of a Truax Improved tube giving rays of high penetration and backing up a spark of from four to six inches, excited by a Morton-Wimshurst-Holtz influence machine having twelve thirty-two inch revolving plates, for the first seven months, and by a machine of the same type having sixteen revolving plates thirty-two inches in diameter for the rest of the time. The anode was placed nine inches from the patient's skin and the duration of the application was fifteen minutes; the tube was focused upon the middle of the anterior surface of the tumor at one seance, upon one side at the next, upon the other side at the next, and so on treating these different areas successively. That the rays penetrated clear through the growth was demonstrable by the fluoroscope when the

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treatments were applied to the sides of the tumor, the rays being visible in considerable volume upon the opposite side. One layer of thin toweling only was interposed between the source of the rays and the patient's skin, and the face, chest, and thighs below the level of the pubis were shielded by the tinfoil gauge No. 22.

During the first two weeks she received six treatments. At this time an area five inches in diameter on the anterior median surface of the growth had softened very noticeably to the depth apparently of about an inch, the skin had become freely movable over this area, the patient's general condition had markedly improved, and the impairment of intestinal and bladder functions had decreased to a very considerable extent. The sensations of pressure in the abdomen, of which the patient had complained bitterly before treatment, had nearly disappeared, she felt greatly improved generally, and had gained three pounds in weight.

To make a long story short she received forty-six applications up to June 5, 1902, a period of 125 days, being an average of 1 radiation every 2.7 days, when the following condition obtained; the antero-posterior diameter had increased to such an extent that the distance between the anterior superior iliac spines, measured over the tumor, was 15 inches with the patient lying flat upon her back, instead of 13¾ inches which it had been when treatment was commenced; the vertical dimension of the tumor had increased on the right side but had decreased on the left side to the extent of about an inch so that the growth was now irregular in outline, its longest axis running diagonally from the upper right hand border about the level of the gall bladder, to a point just to the left of the os pubis. Three or four times since treatment was commenced she had suffered from attacks of sharp prostration accompanied by febrile movement and circulatory acceleration which had lasted for from three to seven days. The last one, which was more severe and of longer duration than the others, having occurred in May. These attacks were probably toxaemic in nature. Aside from these attacks her general condition was very good, she was eating well, sleeping well, constantly gaining in strength, and could walk moderately long distances without difficulty. If it had not been for this improvement in the general condition I think I should have discontinued the treatment at this time as the increase in the size of the tumor did not tend to reassure me as to the ultimate outcome.

On June 7th I sent her to her home in Massachusetts for a ten days' vacation and when she returned a marked change had taken place. All traces of the toxaemia which were present when she went away had disappeared, she walked with the sprightly step of health, there was a good color in her face, and she reported herself as feeling better than for many months. The most striking change, however, was in the tumor; it seemed to have decreased in size about 20 per cent and the patient had found it necessary to shorten her waist bands and the fronts of her skirts to keep them from dragging on the ground. We resumed the treatment with new courage and considerable hope.

From June 17th to September 3d, 1902, a period of 78 days, she received 31 radiations, an average of 1 every 2.5 days. Her general health continued good, her strength steadily increased, and the tumor slowly but steadily lessened in size.

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During the latter part of August she consulted me as to the advisability of resuming her occupation of teaching school which had been interrupted for a good deal more than a year, saying that she then felt amply able to do so and was getting very tired of having nothing to do. It was decided that she should resume her position tentatively, returning to the sanitarium every week or two for further treatment.

This line of management was followed out until April 25, 1903, a period of 234 days, during which she received 46 radiations or an average of practically one every 5 days. On several occasions during this period when she was able to stay but a day, she received two treatments in twenty-four hours. Slight erythema was induced several times which always subsided kindly before the time of her next visit; the skin and subcutaneous tissues had assumed a brawny, leathery consistence, and slight evidences of toxaemia of two or three days' duration but not severe enough to interfere with her daily duties, had appeared three or four times; the tumor had continued to decrease in size, the process of diminution being particularly rapid for several days following each toxaemic attack.

From April 25th to August 29th, 1903, a period of 127 days, she received 8 treatments, an average of 1 every 15.8 days. Following the application on April 25th, she suffered for six days from a sharp attack of toxaemia accompanied by slight soreness of the growth, which was followed by a very marked lessening in size. Her weight at that time (August 29, 1903) was 139 pounds, and the tumor was no longer noticeable when she was clothed.

Early in September, 1903, she developed an area of necrosis as large as a silver half dollar two inches to the right of the median line and just above the upper border of the pubis, which was accompanied by very severe pain for two weeks and by fairly constant but gradually subsiding pain for six weeks more; the ulcer required over three months for complete healing and presented a variation in appearance from the ordinary X-ray ulcer in that no white gangrene was present at any time. It appeared first as a dark-colored scab projecting slightly above the surface of the skin; later pus formed under this scab. When the scab was removed and the cavity washed out the same condition would recur after a few hours. The cavity was about one-quarter of an inch deep with abrupt edges.

She received her next radiation on November 25, 1903, although the ulcer was not yet healed. The tumor had diminished rapidly while the burn was in process of evolution, although no radiations had been given, and presented at this time the appearance of a disc-like mass about three inches in diameter and an inch in thickness, lying to the right of the median line and just above the pubis from which it had now become detached. It was not sensitive to manipulation. The skin over the whole abdomen was mottled dusky red and brawny in consistence; the latter characteristic seemed to extend for some distance into the subcutaneous tissue.

From this time until May 20, 1904, a period of 185 days, 5 radiations were given, being an average of 1 every 37 days. The patient's weight had increased to 147 pounds, and *the tumor had entirely disappeared.* She was examined by Dr. G. N. P. Mead of Winchester, Mass., at that time, and by Drs. Bevan and

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Coley in July, all of whom had had the patient under observation not only while she was under my care but for long periods previously, and all of them confirmed the result of my own examination as regarded the entire disappearance of the growth. A spindle-celled sarcoma, 10 inches in the horizontal from-side-to-side, 8 inches in the vertical, and 5 inches in the antero-posterior diameters, which was inoperable, had resisted every measure applied for its relief, and was rapidly developing lethal symptoms in the person of its victim, was entirely removed and the patient restored to a condition of unimpaired usefulness and apparently perfect health, by 136 applications of X-rays of high penetration from a tube excited by a static machine, the treatment having extended over a period of 849 days, being an average of one application every 6.2 days.

Prominent among the conclusions deducible from this case are the following:

First, Roentgen radiation sometimes brings about the entire disappearance of large, deeply located, malignant neoplasms, which have been proven to be hopelessly lethal in their tendencies under any other management, and simultaneously restores the patient to apparently perfect health.

Second, the fact that it sometimes accomplishes this result, taken in connection with the size of the malignant mass in the case just cited, demonstrates that the lack of satisfactory influence which attends its employment in so many cases is not due to weakness inherent in the remedy itself or to mere thickness of the tissues intervening between the pathological focus and the source of rays, but to some at present undetermined factors which it remains for us to identify and which, it seems justifiable to hope, we may some time in the future eliminate.

Third, there is probably a direct and intimate connection between systemic toxaemia and the disappearance of malignant growths under Roentgen radiation, as indicated by the uniform occurrence of sudden diminution in the size of the tumor immediately following each onset of toxaemic symptoms during the later course of this case.

Fourth, the application of the Roentgen rays to a malignant growth belonging in the same class as the one I have just described, should be persisted in as long as the patient's condition will permit, even if no benefit is observable. It will be remembered that no material effect upon the tumor was demonstrable in this case until after the radiations had been systematically and regularly carried out for six months.

Two other points to which I desire to call your attention are that the rays employed were of a high degree of penetration, and that the tube producing them was excited by a static machine. The belief is prevalent that the rays from a given tube are identical whether the tube be excited by a coil or a static machine. I am not as yet sufficiently well supplied with observations bearing upon this point to feel justified in making any positive statements in reference thereto, but I wish to place myself upon record as believing that there is a vast difference between the therapeutical effect of the rays derived from a tube excited by a static machine and those derived from a coil-excited tube, and that the difference between the rays derived from these two sources will sometimes constitute the difference between success and failure in the management of deeply located malignant processes.

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I am aware that the question of recurrence in this case still remains to be eliminated but for the solution of that problem the future history for several years only is adequate; but even if the growth recurs to-morrow, the present fact remains, that a woman whose condition was such that she was absolutely useless and hopelessly doomed to early death three years ago, has been for two full years restored to a condition of unimpaired usefulness in an arduous walk of life, to a condition of unimpaired comfort in living, and to a degree of apparent general good health as great as, and a body weight that is greater, than she has ever attained in her life before, and that all of these conditions have been obtained solely and entirely through the instrumentality of the Roentgen ray.

ELECTRIC RESONANCE.*

By Karl G. Frank, Ph. D.
of Chicago, Ill.
Formerly Superintendent of the Allgemeine Electricitaetsgesellschaft, Berlin.

When I accepted an invitation to give a lecture before this learned society, I intended to discuss electric oscillations and electric resonance in a more comprehensive manner, but as an apparatus which I expected from Germany has not arrived and is probably lost, and as pressing business has prevented me from preparing for experiments, I have to ask your indulgence for the little I have to say and to show to-night.

I therefore confine myself to a few words about the working of the Oudin Resonator and the phenomena exhibited therewith. The apparatus itself is known to all of you, I presume. Considering the diagram of the connections (Fig. 1) we find that it can easily be divided into two distinctly different parts.

The first part which we will term an "oscillator" consists of a closed circuit of oscillations containing the spark gap "S," and the two Leyden jars, L_1 and L_2, and the lower part of the drum windings of thick wire, so far as to the point where they are touched by the adjustable contact, R. The second part consists simply of the rest of the wire coiled upon the drum in the usual manner. This we will term a "radiator." It is in contrast with the oscillator an "open circuit" of oscillations.

Now what takes place if the apparatus is connected to an induction coil in action?

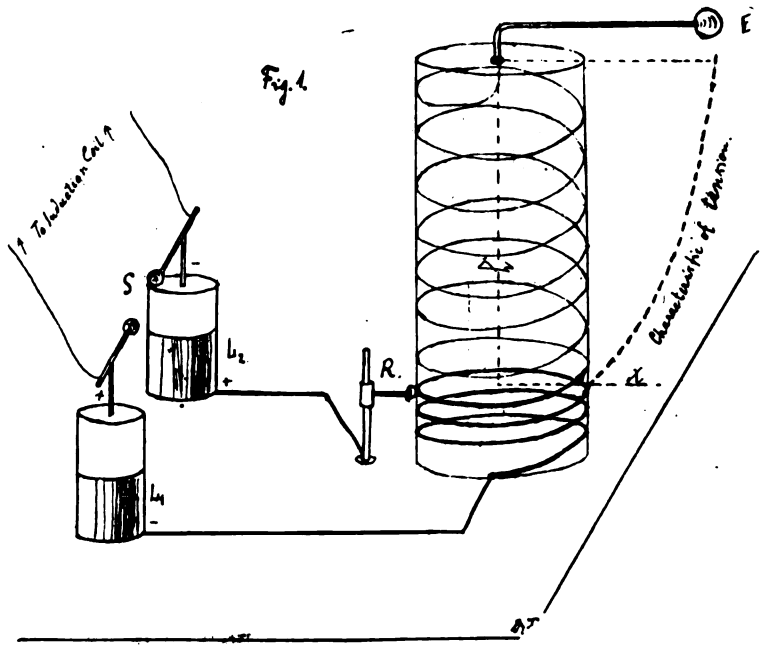
The current from the induction coil flows on the inside coats of the Leyden jars charging them, the one with positive, the other with negative electricity. If then a discharge of the Leyden jars takes place in form of a spark between the balls of the spark gap, which is in metallic contact with the inside coats, that discharge does not constitute a simple flow of electricity in one direction but is under the demonstrated conditions of an oscillatory character. As is alluded to in Fig. 1, the outside coats of the Leyden jars are also charged by induction and are the seats of a great quantity of static electricity of opposite sign. As soon as the opposite charges of the inside coats equalize each other through the spark

*Read before the Chicago Electro-Medical Society, June 28, 1904.

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gap, the electric charges of the outside coats are released and equalize each other through the connecting wire, thus producing a high tension current in the latter. It is apparent from what is said above, that the high tension current in the wire also reverses its direction very rapidly. In other words, an alternating current of high tension and high frequency is set up in the other wire connecting the outside coats of the Leyden jars. The frequency of this current is equal to the number of oscillations of the spark and this is determined not at all by the energy supplying apparatus, as static machinery, induction coil or alternator, but by the amount of self-induction and capacity of the circuit of oscillations. The theory gives the formula: $n=\frac{1}{2\pi\sqrt{LC}}$

n—Number of oscillations.
L—Self-induction.
C—Capacity.



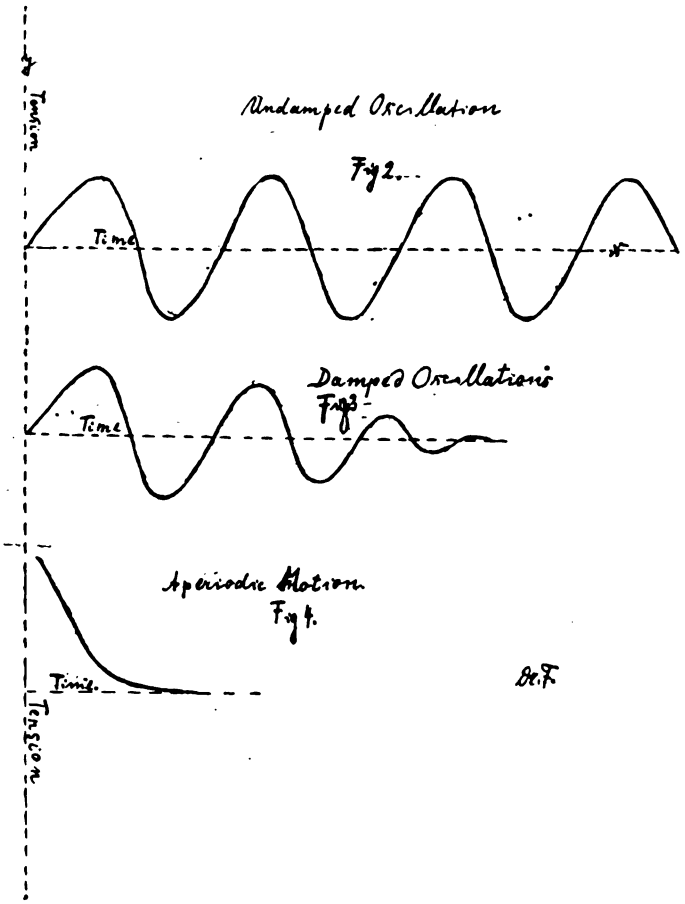
In the apparatus shown here it will amount to about 1,500,000 oscillations per second.

This "closed circuit" possesses two valuable properties; first, it has the character of a reservoir of oscillatory energy, which is kept up in almost undamped oscillations. This expression finds its explanation in the fact that the difference in the amplitudes of a number of following oscillations is very small, so that oscillations of almost the same amplitude are kept up in the circuit as long as the spark passes between the Leyden jars. In a circuit, however, of much dampening, the difference of subsequent amplitudes is very great and the

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oscillations die out quickly. This is the characteristic property of open circuits, radiators, where a large amount of the oscillation energy is spent in propagating into the surrounding space.

The other characteristic property of a "closed circuit" of oscillations is the well-determined number of oscillations; this is of great importance, as will be seen later, as regards the phenomena of resonance.



There are very similar phenomena in acoustics and mechanics which illustrate very nicely the dampening of oscillations. The most instructive perhaps is the case of a pendulum. Undamped oscillations are exhibited, for instance, if a pendulum swings in a medium of little resistance such as air, when a long time elapses before the kinetic energy is used up and the pendulum ceases to swing. Consequently, the difference in the amplitude of a number of subsequent oscillations is very small, so that we get about the following curve if we illustrate graphically the phenomena. (Fig. 2.)

Damped oscillations are shown if then a pendulum swings in a viscous liquid, the resistance of which is so great that it ceased to swing after a few oscillations

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or becomes even a periodic, that is, will not perform any oscillations at all but simply moves back slowly to its position of rest. In this case the energy is mainly spent in imparting motion to the liquid. Fig. 3 shows damped oscillations and Fig. 4, a periodic movement.

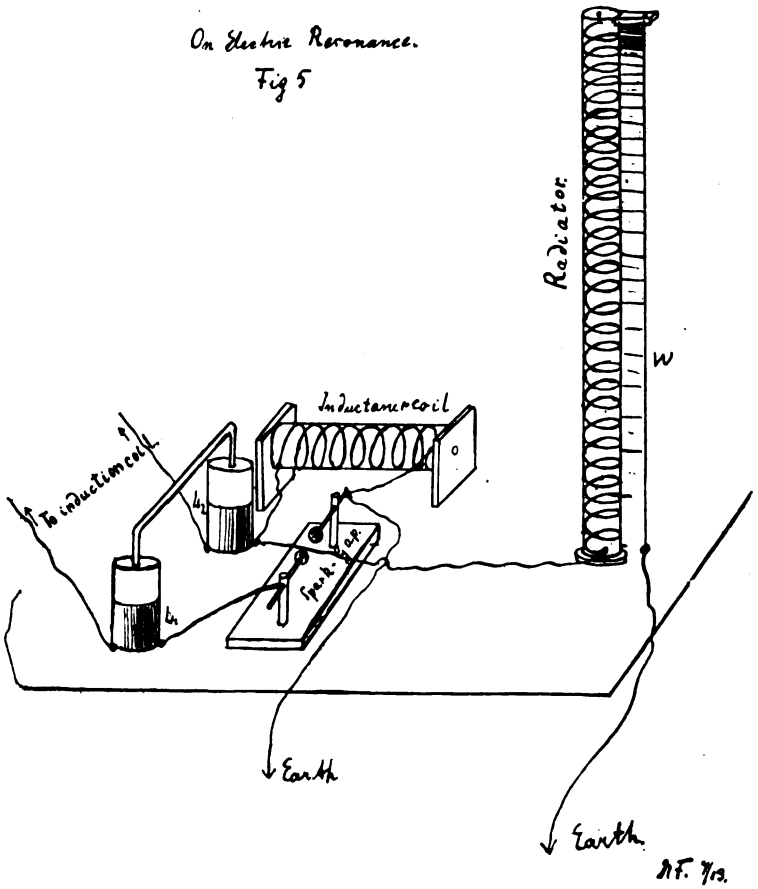
Returning to the Oudin Resonator, we are now enabled to explain its electric properties. The sparking circuit, the oscillator, forms a reservoir of electrokinetic energy in form of almost undamped electric oscillations of a well-defined period, and connected to it, "coupled," as the terminus technicus says, is the radiator, an open circuit taking electrical energy from the oscillator and swinging in highly damped oscillations. These are the typical phenomena which occur in all similar arrangements, of this kind. We saw that by self-induction and capacity in the oscillator, the period determined. In order to obtain resonance we have to impart such electrical properties to the radiator that the same number of oscillations occur as in the oscillator. It is easy to conceive that the radiator has a proper period of oscillations as well as the oscillator, since it possesses capacity as well as self-induction, therefore to obtain resonance of oscillator and radiator, it is necessary to adjust self-induction and capacity of one of them in reference to the other, or as the technical term runs, to tune the system. In the case of the Oudin Resonator (and almost generally) the self-induction of the oscillator is changed. Suppose now we succeeded in obtaining a tuned system, what is the advantage of it and what are the principal features? The main advantage compared with an untuned system is, that the electricity stored up in the oscillator immediately compensates the energy spent by radiator and thus renders the most powerful radiations possible. This is done by means of the regulator, R, Fig. 1, sliding along the drum winding and cutting out from or adding turns to the oscillator. Here I may call attention to the fact that the oscillations of the sparks are also the generators of Hertzian electro-magnetic waves which are used in wireless telegraphy.

Without entering into details I will simply state further facts which are proved by theory and experiment, that if oscillator and radiator are in resonance, the state of electrification along the wire of the radiator is such that the tension steadily increases toward the top terminal where it reaches a maximum. This is illustrated by the dotted line in Fig. 1, the abscessae representing the tension and the axis of the radiator coil assumed to be the axis of the co-ordinates.

We find the mechanical analogue of such a tuned system, represented by a pendulum which receives a new impulse of the same direction as its own movement just at the beginning of new swinging, the impulse thus adding kinetic energy to that of the pendulum and thus more and more increasing its amplitude until it reaches the maxium. An untuned system as is apparent will never yield oscillations of such an amplitude. In the special case of the Oudin Resonator, this can be shown by the smaller luminosity of the evacuated tubes, and the decrease in effluviation. As it will be shown later by means of the demonstration apparatus, the seat of the maximum amplitude in an untuned system is no more the upper terminal of the resonator, but it appears anywhere between the two ends of the winding according to the wave length determined by the oscillator.

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In my arguments I confined myself to a consideration of the most simple case and did not refer to the multiple resonance nor to resonance with the oscillations in the induction soil; for not only oscillator and radiator have to be in resonance, but there is a whole chain of electric circuits whose links are coupled by induction and which all ought to be in resonance. These links are the primary circuit of the induction coil, the secondary, the oscillator and the radiator. But as the discussion of these parts would carry us too far into details, only interesting to the physicist and designer of induction coils, I will not dwell on it. In conclusion, I am going to demonstrate the behavior of a tuned and untuned system of radiator and oscillator by means of an apparatus designed by Dr. Siebt of Germany.



As shown in Fig. 5, the arrangement is in all essential parts the same as for the Oudin resonator. The outside coats of two Leyden jars, L L, are connected to a spark gap and inductance coil of thick copper wire, the inside coats of the jars in metallic connection with each other. The radiator consists of a very long coil of thin wire, parallel to which an earthed wire, W, is carried along.

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You will evidently see the maximum of effluviation there where the highest tension appear between the earthed wire and the radiator. As long as the inductance coil is in the circuit, the maximum of luminosity is on the top. As soon as I take the induction out of the circuit, decreasing thus its self-induction, and destroying the resonance, we obtain neither a maximum at the top, nor is the effluviation as powerful.

I take the opportunity here to thank Mr. R. Friedlander by whose courtesy I was enabled to carry out the experiments and build the apparatus in his factory.

Discussion.

Dr. Lave said that the paper was particularly interesting to him, because he had for a considerable time used the D'Arsonval or Oudin Resonator, and had given considerable attention to the application of the current produced by this apparatus. He asked Dr. Frank why a severe shock would be given to a patient, if a Leyden jar was punctured while the patient was being treated with the resonator. The patient is apparently not in direct connection with the internal coatings of the Leyden jars and when there was no break, would feel absolutely no sensation whatever during the treatment.

Dr. Frank replied that if a spark gap, "S" (see Fig. 1), is too small, an arc discharge will pass between the two balls and no oscillations will be set up. On the other hand, if the spark gap be too large, the spark will not be oscillatory. In the first case, the electric discharge is changed largely into heat. In the last case less heat is developed but more light; the spark is brighter than when arcing takes place, but as said before electric oscillations are obtained only when the spark gap is correctly adjusted. In the case mentioned by Dr. Lave, it was a kind of short circuit from the inside of one Leyden jar to its outer-coating, thence from the resonator coil and the body of the patient to the earth, thus giving the patient the direct discharge from the induction coil which we know is very painful.

Mr. Treadwell said that the paper was very interesting to him in that it made plain the fundamental phenomena of resonance as related to this form of apparatus. Just as we have resonance in sound apparatus when an organ pipe sounds out a full tone because the air column within the pipe oscillates to the flutter produced by the wind blowing against the lip in the lower part of the pipe and thus a full musical tone is produced, so we can have electric oscillations set up as explained by Dr. Frank in the lower part of the resonator coil which set up oscillations in the upper part of the coil, these oscillations not differing in frequency from the fundamental oscillations due to the capacity and self-induction of the Leyden jar circuits. Mr. Treadwell said he very well knew electro-therapeutists were well agreed that the oscillations obtained from the static machine were exceeded in frequency by the current from a therapeutic Tesla coil and this current in turn exceeded in frequency by the resonator current. He had not been able to find any warrant for this opinion. On the contrary, the Tesla or the Oudin apparatus if energized by the discharges from a static machine may both give the same frequency of oscillation as that from the Leyden jar discharges of the static machine, so that when Dr. Rice uses the

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glass electrodes connected directly with one electrode of the static machine, and the other grounded, it is possible that she is getting a current of just as high frequency as if she were to connect a resonator or Tesla coil with the static machine. The only factors upon which the frequency of a current depend are those shown by Dr. Frank; the capacity of the circuit and its self-induction. To be sure, the jars on the resonator may be so adjusted that the capacity and self-induction shall be such that the high frequency shall be very large, but there is nothing in the construction of either set of apparatus that would necessarily make the resonator current the one of highest frequency. Indeed, it might well be of less frequency.

Dr. Burdick said that Dr. Frank deserved great credit for the care taken in the construction of the apparatus and to be congratulated on the success of his experiments. He understood that the last speaker maintained that the frequency of this apparatus was constant whereas he believed that nothing was easier than to change the number of oscillations of any high frequency apparatus. In wireless telegraphy, the receiving apparatus is made to respond to oscillations from the sending apparatus by changing the self-induction of the former and the frequency depends more on the self-induction than on the capacity. Long waves would be generated if the self-induction is lessened and the frequency of these waves would therefore also be lessened, since the frequency and length of waves are always in inverse ratio, that is, the longer the wave the smaller the frequency. In the continuous current the effect of the self-induction does not play any part in the amount of amperage derived by any given electro-motor force, but it is of importance in the interrupted or alternating current.

If a wire be held parallel to a wire carrying a continuous current, no effect is produced in the secondary wire unless the current is interrupted in the primary. This inductive effect of interrupted current or alternating current upon wire in the immediate neighborhood of the interrupted or alternating current, is proved by the experiments just cited and the greater the voltage in this interrupted primary current, the greater distance can the secondary wire be placed. Indeed, it is not necessary to connect that resonating circular with the primary circuit.

Some years ago as he had already mentioned to the society, he had made a resonating apparatus by winding the wire on a bass drum. He had two of these solenoids, one of which he connected to the secondary of an induction coil through a spark gap and in this, primary oscillations were set up. The resonating solenoid was placed parallel to this primary solenoid and induced currents were generated in this. So great was the volume of the current and the inductive effect upon iron, that if tin were placed in the center of the bass drum without being in contact with the wire at all, it would burn with explosive violence and a bar of steel would if placed in the same position be quickly raised to incandescence. The human arm, however, could be put in this position without experiencing any effect whatever because the body acts as a condenser and protects itself from the terrific turmoil set up by these electric oscillations.

In closing, Dr. Frank said that there are two different systems of wireless telegraphy in Germany, a direct coupled system and an inductively coupled system, and Dr. Burdick was correct in the statement that the frequency of

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a sending or receiving apparatus could be adjusted by changing the self-induction of the circuit.

The Tesla coils have a self-induction which is usually too great, and it therefore gives mixed waves. He had hoped to have some of his apparatus to exhibit before the society and when it arrives he will be pleased to explain its operation at some later meeting.

Editorial.

THE ST. LOUIS CONVENTIONS.

The 1904 electro-therapeutical conventions are now over and although they may fairly be characterized as successful, yet we believe that the experiences of those who attended will lead them to think twice before deciding to hold future conventions in such close proximity to outside attractions of such magnitude and variety as were in evidence at St. Louis. Men cannot be expected to go to such a place as is this beautiful city during the continuance of the Exposition and not investigate the wonders, and when the investigation is once commenced each step opens up new vistas of attraction; the result must necessarily be to decrease the attendance at the scientific sessions and to impair the character of the work done. The American Roentgen Ray Society avoided much of this adverse influence by having its headquarters and meeting-place down town, where its members were far away from temptation, the result being a very good attendance and good sessions; an effect was felt, however, on the exhibition of apparatus, which was the smallest in the Society's history. The American Electro-Therapeutic Association, on the other hand, with its headquarters and meeting place at the Inside Inn, was exposed to the full force of these adverse conditions and additionally to the counter attraction constituted by the simultaneous sessions of the International Electrical Congress, many of its members being affiliated with the latter body, and the wonder is that it could do any work at all. The well-known earnestness of the members of this body, however, overcame all other attractions to a certain extent, as we have stated above, and brought the convention to a fairly successful issue. The scientific programs of all three bodies were of unusual excellence and merited a much larger attendance.

Of the social features of the programs we can speak with nothing but gratification. The courteous and efficient chairman of the committee on arrangements, Dr. C. H. Hughes of St. Louis, had these matters in charge for the American Electro-Therapeutic Association and we are free to admit that they were never in better hands. The reception given to the Fellows of the Association and their guests by the State of Missouri in the beautiful Missouri building Tuesday night was one of the most enjoyable events of like character in the history of the Association, in spite of a heavy downpour of rain which continued throughout the function. The charming urbanity and frank cordiality of the amiable hostesses of the Missouri building, Mrs. Nuckols and Mrs. Small, and of their lady

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associates on the reception committee, Mrs. Hawthorne, Mrs. Gentry, Mrs. Griffith, Mrs. Morris, Mrs. Gehrung and others, together with the kindly welcome extended by Commissioner Davis and Judge Hawthorne, both of the Missouri building, was worthy of even a state so noted for its hospitality as is Missouri, and produced a glow in the hearts of those fortunate enough to be recipients which will cause their visit to the Louisiana Purchase Exposition to live among the happiest of their memories.

Of the Fair proper it is not our province to speak; suffice it to say, therefore, that few of those who visited this greatest of all Expositions will have cause to regret it. It is the greatest general educational institution that has ever been made available for the public.

The officers elected by the American Electro-Therapeutic Association for the coming year are as follows: President, Emil Heuel of New York, N. Y.; First Vice-President, Charles Hamilton Hughes of St. Louis, Mo.; Second Vice-President, Morris Weil Brinkmann of New York, N. Y.; Treasurer, Richard Joseph Nunn, Savannah, Ga.; Secretary, Clarence Edward Skinner, New Haven, Conn.; Executive Council, Thomas Davidson Crothers, Hartford, Conn.; Charles Rea Dickson, Toronto, Canada; Daniel Roberts Brower, Chicago, Ill.; Charles Olin Files, Portland, Maine; Fred Harris Morse, Boston, Mass., and Alphonso David Rockwell, New York, N. Y. By the American Roentgen Ray Society, President, Dr. Charles L. Leonard, Philadelphia, Penn.; Vice-Presidents, Dr. James P. Marsh, Troy, N. Y.; Dr. Weston A. Price, Cleveland, Ohio; Dr. Henry Hulst, Grand Rapids, Mich., and Dr. Gordon G. Burdick, Chicago, Ill.; Secretary, Dr. Russell H. Boggs, Pittsburg, Penn.; Treasurer, Dr. Leavitt E. Custer, Dayton, Ohio; Executive Committee, Drs. P. M. Hickey, Detroit, Mich.; Kennon Dunham, Cincinnati, Ohio, and George C. Johnston, Pittsburg, Penn.

NIELS R. FINSEN.

Dr. Niels R. Finsen, of Copenhagen, Denmark, died on September 24, 1904. Dr. Finsen was one of the most remarkable figures in the medical world of today, and his name will go down to posterity as the pioneer in the development of one of the most remarkable and efficient means of relief for the suffering that has ever been discovered, radio-therapy. We do not believe it necessary to enter into a lengthy description of Finsen's life to the readers of this journal; his name is a household word to all who are at all interested in radiology. Suffice it therefor, if in passing we cast a laurel leaf upon the memory of this truly great, but quiet, modest, self-sacrificing life that was expended in scientific search for things that would conduce to the benefit of others, and say, in the light of the marvellous results that have accrued from his work, he "Builded better than he knew."

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Miscellaneous Abstracts

ELECTRO-THERAPY.

A CASE OF FIBROMYXOSARCOMA OF THE SACRUM OF LARGE SIZE SUCCESSFULLY TREATED BY CATAPHORIC OPERATIONS, WITH PRESERVATION OF THE SPHINCTER.

G. Betton Massey—American Medicine, August 27, 1904.

This case was reported at a meeting of the Philadelphia County Medical Society, June 22, 1904, and the patient who was a woman aged twenty-six, was exhibited. In the spring of 1903 a tumor was discovered in the pelvis, and laparotomy was done which showed it to be attached to the sacrum and inoperable, whereupon the incision was closed and an unfavorable prognosis given. Dr. W. W. Keen of Philadelphia was then consulted and concurred in the diagnosis and prognosis. She came under Dr. Massey's care in October, 1903, when examination showed a hard growth the size of two fists posterior to the rectum and attached to the inner surface of the sacrum by a broad base. The lower border curved back to the sacrum at a point about two inches from the anus and the upper edge could not be reached by the finger. The tumor grew rapidly and it was decided to treat it by Dr. Massey's method of massive mercuric cataphoresis. The first application was made October 5, 1903, the patient being "anesthetized and placed on a specially prepared negative pad on a cot, in the Sims' position, the skin over the upper portion of the coccyx was incised to admit a sharp-pointed zinc-mercury electrode somewhat larger than a lead pencil, the unusual thickness of the electrode being arranged to prevent breakage when softened with mercury. Through the slit thus made in the skin the electrode was forcibly thrust into the still healthy tissues surrounding the coccyx, and directed upward into the middle of the growth by a finger in the rectum. This route through the healthy tissues above the anus was selected to avoid interference with the anal sphincter, and also because it was anticipated, as it subsequently occurred, that the slough would be too large to come away through an intact anus." 1600 milliamperes were passed for three hours. The conditions immediately after the operation were as follows: A round grayish-colored area of devitalized and sterilized skin, subcutaneous tissue, and sarcomatous tissue had been produced with a diameter of about three inches extending deeply into the growth. The growth had become softer and shrunken as ascertained by rectal touch. On the twenty-first day after the operation three of the bones of the coccyx and one-half of the tumor came away bloodlessly. The posterior wall of the rectum had been destroyed and all the fecal movements passed through the wound. On November 4, the second and final application was made to the remainder of the tumor, 1200 milliamperes being passed for two hours which resulted sixteen days later in the remainder of the tumor coming away, it being somewhat larger than a man's fist, and three days later the detached, devitalized first segment of the coccyx was removed. It was attempted without success to cause the fecal discharges to pass through the

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anus by the insertion of hard rubber tubes through the anus to keep it patulous, but all bowel movements continued to pass through the wound until late in the winter when the narrowing of the wound diverted the feces into the natural channel. "The patient sat up in the second week of December, went downstairs on Christmas day, and walked out January 10. On January 13 she had the first natural movement through the anus." At the time the patient was presented seven months after the last application she was in unusually good health with no evidences of the growth remaining. The sinus which persists is only large enough to admit a small pea and Dr. Massey believes that this will ultimately heal entirely. Histological examination of a section of the growth demonstrated it to be fibromyxosarcoma.

THE USE OF ELECTRICITY IN SKIN GRAFTING.

John D. Rushmore—Annals of Surgery, September, 1904.

Rushmore's experience leads him to believe that the application of the "effluve" from a high frequency electrical apparatus is of great assistance in securing repair on old obstinate ulcerated surfaces by skin grafting. His technique is that recommended by J. Sherman Wight in a paper read before the New York State Medical Society, January 27, 1904, and is as follows: "Render the granulating surface sterile; prepare it to receive the grafts by curetting it thoroughly; and, while it is still oozing, place the grafts of any form desired in position, on the surface and bathed in blood; apply the high frequency discharge from a pointed electrode at about one-quarter inch distance over the entire surface till clotting is firm and the grafts are fixed in a dry surface. Serum that is squeezed out in the process of clotting should be sponged off. The dressing consists of three per cent carbolized vaseline and plain sterile gause. It is renewed at the end of the third day. The repair follows in the usual way, but takes a shorter course. Repair was hastened in some cases in which the secondary Roentgen Rays were used at the end of the first week."

Seven cases are reported of obstinate ulceration on different parts of the body, three of which were healed in from three to six weeks under this method and four of which were still under treatment when the report was written. Rushmore believes that the beneficial influence observed may be due to the property of congulating blood exhibited by the high frequency discharge, whereby the grafts are firmly fixed in position, and concludes that "in our attempts at healing old granulating surfaces with small grafts, we have in the use of the electric method a more exact and successful way than any heretofore employed, by fixing the grafts in the granulating surface."

ON THE USE OF AN ELECTRO-MAGNET FOR REMOVAL OF A FOREIGN BODY FROM A BRONCHUS.

Andrew J. Hossmer—Annals of Surgery, September, 1904.

A child sixteen months old while playing with a shingle nail swallowed it. Moderate cough and wheezing respiration were the only symptoms following and the child came under Dr. Hossmer's care on April 7, 1904, seven days after

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the accident. The X-Rays demonstrated that the nail was in the left bronchus, the head downward, and located at the level of the upper border of the seventh rib on the left side, the point reaching upward, diagonally to the lower border of the fourth rib on the right side; the nail, therefore, was behind the base of the heart, the removal of a foreign body from this situation being most difficult and dangerous. The use of a magnet introduced through a simple tracheotory wound was suggested by an attempt to do the same thing some two years ago made by Dr. A. V. L. Brokaw of St. Louis, Dr. Brokaw, however, being unsuccessful. Dr. G. B. Pfoutz, Dr. H. C. Deane and Mr. Murray Godbe, an electrical engineer, were consulted as to the construction of a magnet which would be applicable to the case in hand and a description of the resulting instrument follow: "The magnet consisted of a Norway iron core, five-eighths of an inch in diameter and eleven inches long, on which was wound, in two sections, 6,400 feet of No. 24 double cotton-covered magnet wire, making 9,000 convolutions around the core, and having 160 ohms resistance.

"It was designed for operation on 250 volt direct current, that being the service available in your (Dr. Hossmer's) operating room. With that voltage there was passed one and one-half amperes of current, or 13,500 ampere turns around the magnet core. The end of the core was drilled and tapped to receive the Norway iron stems, a number of which were made in different sizes and shapes in order that you (Dr. Hossmer) might select the one suitable for your operation.'' The "pull" exercised by this instrument was sufficient to attract a shingle nail for about two inches through space; in terms of exactitude, being "A lifting power at this point of 100 grammes, and a pull of 10 grammes, on the substance one-fourth inch from its point." The stem selected for use was of one-quarter inch Norway iron bent in a curve of about 80 degrees. Thirteen days after the nail was swallowed, Dr. Hossmer made a low tracheotory, introduced the tip of the instrument down along the trachea as near as possible to the point of the nail and turned the current on; a sharp click instantly followed, indicating that the nail had made contact with the magnet, which was then carefully withdrawn with the nail clinging to it. The child made an uninterrupted recovery. The example of Dr. Hossmer in calling to his aid an electrical expert to superintend the construction of a magnet to be used for such a purpose cannot be too highly commended, as its efficiency would be greatly impaired if not constructed according to physical laws with which only an expert would be familiar.

RADIO-DIAGNOSIS.

THE REGULATION OF THE X-RAY TUBE.

J. Sherman Wight—New York Medical Journal, July 30, 1904.

In treating of this subject the author refers to the theory of J. J. Thomson, that ions are electrified particles having charges of positive or negative electricity, and the process by which gas is made a conductor of electricity is the ionization of the gas. A trace of impurity in the gas produces surprisingly large effects in the cathode fall of potential. An auxilary tube giving emanations, ionizes the

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gas in the main tube and increases its electrical conductivity. The regulation of the tube requires

1. A tube of glass as thin as is consistent with strength.
2. An auxiliary tube, attached to the main tube sending emanations into it (the addition of some volatile salt may be of some advantage). This auxiliary tube should have a spark gap adjustment.
3. An adjustable cathode.
4. Change of voltage outside the tube.

A FURTHER CONTRIBUTION TO THE RADIOLOGY OF TRAUMATISMS OF THE HEAD.

Professor Moritz Benedikt—Zeitschrift für Elektrotherapie, Vol. 6, No. 7, 1904.

The author tries to prove the incorrectness of the general belief according to which in pictures of the head only osseous structures are seen. That this idea is a wrong one is evidenced already by the fact that in profile pictures we see not only the frontal sinus of one side, but also that of the other side. And not only that, but also the ethmoidal cells and the sphenoidal sinus.

By the use of *diaphragms* the pictures are made more distinct and more plastic. In the perfection of these diaphragms lies the salient point as regards the further development of Roentgen Ray pictures.

It would be beyond the limits of these short reviews to give all the details of this excellent article. These as well as the classical pictures should be studied by everybody interested in Roentgenography.

THE ROENTGEN RAYS IN INJURIES NEAR THE WRIST.

M. I. Wilbert—American Medicine, September 17, 1904.

Of all fractures that of the lower end of the radius has been recognized as the most common. The full extent of the accompanying injuries and their importance was not recognized until the advent of the X-rays. Fractures at or near the wrist joint, contrary to the usual teaching, may and actually do, vary very considerably in the location and direction of the fracture, as well as the nature and extent of the accompanying injuries to the other structures. During the past seven years all fractures of the extremities brought to the German Hospital have been referred to the X-ray laboratory as a routine part of their treatment.

From January, 1897, to January, 1904, there are records of 2,611 cases of fractures of the extremities. Of these 660, or a little more than a fourth, were fractures at or near the wrist joint. The season of the year has much to do with the number of fractures at this point. From October to March there were 401 cases of fracture at the wrist, while in the remaining six months, from April to September, inclusive, there were but 257 such cases recorded. Divided according to seasons they occurred as follows: Winter, 227; spring, 145; summer, 135; and autumn, 153 cases. The greatest number of fractures at the wrist that we have met in any one month was 23, in February, 1901. Of 481 fractures at the wrist

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351 occurred in males and 130 in females; 221 involved the right and 260 the left side of the patient. In 9 patients both sides were involved.

A table of approximate ages is also appended:

1 to 10	1
2 to 20	101
21 to 30	102
31 to 40	75
41 to 50	78
51 to 60	73
61 to 70	32
Over 71	5

A list of the bones involved will also prove of interest, indicating, as it does, the comparative frequency of fractures of these several bones.

INJURIES AT THE WRIST.

Radius alone	172
Radius and lower end of the ulna	129
Radius and ulna higher up	17
Ulna alone	21
Carpus alone	85
Radius and carpus	36
Radius, carpus and ulna	12
Carpus and ulna	7
Carpus and metacarpals	2

A considerable proportion of the fractures of the radius are of such a nature that it would be difficult to recognize them without the use of the Roentgen rays.

Fractures of the lower end of the radius may and sometimes are accompanied by a forward displacement of the lower fragment. In our experience this particular accident has been rather uncommon as we have but four cases on record in which this condition was found. Two of these cases were in children under 15, and were little more than epiphyseal fractures, with a complete displacement of the hand to the volar side.

Fractures of the lower extremity of the ulna, while not nearly as common as the corresponding lesion in the radius, do occur, and are of sufficient importance to merit attention.

It is in connection with the fractures of the carpal bones that the X-ray will continue to be of the greatest importance in cases of injury at the wrist joint.

By far the greater part of the motion of the hand on the forearm is due to the motion of the carpal bones, one upon the other, in the intercarpal articulations, and not, as is usually taught, at the articulation of the carpus with the radius. This is particularly true of extension and flexion, which motion occurs almost entirely between the first and second rows of carpal bones. The lateral motion of the hand, adduction, and abduction, is also largely dependent on the free movement of the carpal bones.

In 7 per cent of all the cases recorded, a fracture of one or more of the carpal bones was found to exist. In 4 per cent of the total number the fracture was demonstrated to be entirely confined to the carpus. The etiology of frac-

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tures of the carpus is usually ascribed to direct violence or crushes. This has not been our experience, as by far the greater number of fractures of the carpal bones that we have met with have been occasioned by falls on the extended hand or the closed fist.

Another item of interest is the recurrence of a fracture in the callous formation of a previous injury. Here the Roentgen rays are of inestimable value in forming a correct diagnosis.

RADIO-THERAPY.

THE USES OF X-RAY IN MEDICINE AND SURGERY.

Russell H. Boggs—Medical News, August 29, 1904.

The therapeutic uses of the X-Ray to-day exceed the diagnostic uses and a correct technique is believed to be of the first importance in the securing of satisfactory results. As regards technique, Boggs does not believe that "There is any specialty that requires more careful and hard study than radiotherapy. The X-Ray tube can give a light that will only travel several inches from the tube, or it can give a light that will fluoresce on a screen and show the bones of the hand 175 feet from the apparatus. These rays seem to have a different place therapeutically, the rays from the low tube are very active and have a more destructive action on the tissue, while those given off from the high tube are more stimulating."

He divides cases amenable to X-Ray therapy into four classes, namely:

"1. Those cases which respond readily and as a rule do not need surgical interference, viz., lupus, epithelioma of the face, acne, eczema and tuberculous glands.

"2. Those which should be treated for a short time, the mass removed and then continue X-Ray treatment to prevent recurrence, viz., carcinoma.

"3. Those cases of carcinoma which are considered inoperable should be treated to prolong the patient's life and make him more comfortable.

"4. Tuberculosis. Many of these cases in the initial stage respond to X-Ray treatment. But here the X-Ray should only be considered a useful adjunct."

In the treatment of lupus, acne, chronic eczema, etc., the X-Ray is believed to be the most effective treatment known. In some cases of these diseases, however, he recommends the use of the Finsen light and the high frequency current in connection with the X-Ray. He also believes that many growths which are to be removed surgically should be treated for a while before operation by the X-Rays. In cancer of the breast with involvement of the axillary glands it is best to ray the glands before operation until they disappear, which he considers, as a rule, they will do, and then remove only the breast and not the glands. Several cases are cited to illustrate the clinical confirmation of the position taken by the writer on these points.

He believes that the majority of cases of superficial epithelioma which have not responded to X-Ray therapy have failed to respond because the rays employed were too penetrating, and speaks of a case which had been treated for some time

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with rays of high penetration with no result. The patient then went to another operator who used rays of a very low degree of penetration and in four weeks the epithelioma had entirely disappeared.

X-RAY THERAPY IN LEUKEMIA. A PRELIMINARY REPORT. WITH SPECIAL REFERENCE TO LYMPHATIC LEUKEMIA.

Joseph A. Capps and Joseph F. Smith—Jour. A. M. A., Sept. 24, 1904.

A personal experience with eight cases of both lympathic and splenomyelogenic leukemia and a study of the cases which have been reported to date by others, lead the authors to the following conclusions with regard to the use of the X-Rays in the management of leukemia:

"1. The action of the X-Ray in leukemia seems to be of two kinds: (a) A local influence on the spleen and glands, characterized by an inflammatory reaction and later by a breaking down and disintegration of the gland tissue. (b) The formation of toxins which have an inhibitory action on the manufacture of leucocytes by the bone marrow. It is well known that acute infections occurring in leukemia, such as pneumonia, septicemia or terminal infections, tend to inhibit the production of white corpuscles and often cause a reduction in the size of the spleen or gland tumors. The X-Ray toxins may be compared to those produced by such infections.

"2. In no recorded instance of either lympathic or splenomyelogenic leukemia has the spleen tumor entirely disappeared.

"3. With the discontinuance of the X-Ray the disease, after varying periods, tends to reassert itself.

"4. Death may take place when the glands and spleen are smallest, and when the white count is normal.

"5. Acute cases seem to receive no benefit from the X-Ray.

"6. The chronic form of lympathic leukemia responds to the X-Ray even more promptly than the splenomyelogenic type. In every instance the glands rapidly softened and dwindled to small proportions.

"7. The X-Ray holds the disease process in abeyance, but probably is not curative. Yet it is too soon to say that persistent treatment of an early case may not give permanent relief."

X-RAY THERAPEUTICS OF SURGICAL TUBERCULOSIS.

J. B. Guthrie—New Orleans Med. & Sur. Jour., Sept. 1904.

It is now generally conceded that the X-Ray exercises no appreciable influence upon pure cultures of the tubercle bacillus, even when exposed for long periods of time to the action of this agent. The different results which have been obtained by some writers is believed to be due to electrical disturbances set up in the culture through induction from the excited tube, the formation of ozone and other products of atmospheric decomposition caused by the electrical influences from the excited tube and the effects of which have been erroneously attributed to the X-Rays. In cases of inoculation tuberculosis, however, the

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results are entirely different, the subjects of such inoculation recovering entirely under Roentgen radiation, while the control animals which were inoculated and kept under the same conditions except that they were not exposed to the X-Rays, died.

The effects of the X-Rays upon the development of the Tubercle bacillus in living tissue is probably due to the stimulant influence exerted upon the physiological resistance of the cells composing such tissues, whereby these cells are able to destroy and get rid of the germs themselves. Guthrie has demonstrated the power of the X-Ray to clean off the surfaces of ulcers of various sorts by omitting the usual antiseptic treatment while the radiations are going on. He says, "The response to radio-therapy of acne and pyogenic infection of the hair follicles convinces one that although the X-light is not a germicide per se, that upon bacteria in the tissues it does act as a destructive agent probably by causing a local leucocytic migration and proliferation of the embryonic fixed tissue cells. It is well demonstrated that in many granulomata there is a marked degeneration of neoplastic cells and a stimulation of normal tissues. Tuberculous lesions are essentially infective granulomata and if these are capable of being destroyed when superficially located it remains for us to perfect our technique in order to bring about the same result in more deeply seated lesions."

As several hundreds of cases of lupus vulgaris are now on record in which a satisfactory result has been secured by Roentgen radiation and as sufficient time has elapsed to prove the permanency of the result, Guthrie believes that radio-therapy has proven its right to be considered the best treatment for this form of tuberculosis. The Finsen ray and the X-Ray divide the honors in this field and some cases that will not respond to one will respond to the other and we cannot tell in advance which cases will yield to treatment. Some cases, of course, will not respond to either.

Enough successful cases of tuberculous glands in the neck which have been treated by Roentgen radiation are now recorded to warrant a trial of this agent in primary cases before operating when a good cosmetic result is important or when sinuses are so extensive as to render operation out of the question.

Two cases of tuberculous glands of the neck are reported. The first occurred in a young man and was operated on by a competent surgeon. Sinuses persisted for two months after the operation when the patient came under Dr. Guthrie's care. Ten applications of the Roentgen rays (technique not described) caused the sinus to heal and the inflammatory tissue surrounding it to be absorbed.

The second case occurred in a woman aged twenty-five who had undergone three operations for tuberculous cervical glands previous to her coming under Dr. Guthrie's treatment. Two glands were involved on each side just below the mastoid processes, one in front and one behind the sterno-cleide-mastoid muscle, the largest being the size of an English walnut and the smallest the size of a pea; all were firmly bound down by inflammatory adhesions. The patient's general condition was poor. During ten weeks she received thirty-two Roentgen radiations (technique not described) the glands diminishing markedly in size and becoming freely movable, the largest gland then being not larger than a pea.

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At this time the patient was obliged to stop treatment and Dr. Guthrie lost sight of the case but states his belief that continuation of the treatment would produce a cure.

One case of spondylitis exhibiting pyogenic as well as tuberculous infection in a man aged twenty-four who had suffered with tuberculous caries of the vertebrae for four years, five sinuses being present in the left groin, was given six treatments, the sinuses healing as a result and the patient's general condition being improved. When he came under treatment urine contained 10 per cent of albumin, hyaline and granular casts. Patient then believing himself well on the road to recovery, discontinued treatment and went home.

Very interesting cases of tuberculous spondylitis reported by Dr. John B. Murphy are quoted and referred to at some length.

THE ROENTGEN RAYS IN THE TREATMENT OF TUBERCULOSIS OF THE JOINTS.

J. Rudis-Jicinsky—N. Y. Med. Jour. & Phila. Med., Jour., August 27, 1904.

Jicinsky's experience in treating joint tuberculosis by Roentgen radiation leads him to conclude that the amount of improvement that can be quickly obtained thereby is almost incredible to the average individual. "The X-Ray will not only absolutely diagnosticate tuberculosis of the joints for us in the earliest stages of development; it will, by fluoroscopic examination, not only show us the smallest tuberculous focus developing in the spongy tissue of the bone near the epiphysis, or any extension of the destructive process toward the surface of the joint, or perforation of the joint by this focus, or the inception of tuberculous synovitis or the presence of other secondary affections complicated by abscess; but it will show us the effusion by dark and marked shadows, indicating destruction, necrosis, or caries of the bones plainly, and will for the main part remedy all these troubles, at the same time building up a greatly improved muscular system about the affected joint if properly treated. The joint—hip, knee, spine, foot, or hand—soon grows stronger in every part, showing a greatly improved condition, and thus proving that joint tuberculosis offers, perhaps, the best field for the X-Ray worker among all the other possibilities lying in the near bright future."

He reports four cases of tuberculous dactylitis which have been entirely cured; the bone which was previously diseased having been restored to normal structure as indicated by skiagraphs; two cases of tuberculosis of the hip joint in which entire cure with a minimum of ankylosis was the result; four cases of tuberculosis of the knee joint involving the bony structure which were cured, two cases of tuberculosis of the spine in which the results were negative; eight cases of tuberculosis involving the synovial membrane only, in which cure resulted in six weeks. Two patients with tuberculosis of the knee have died, one of tuberculous meningitis, the other from shock after amputation. Two cases have yielded negative results and three cases are still under treatment and doing comparatively well.

All cases of joint tuberculosis should be immobilized with proper supports

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while undergoing X-Ray treatments and in cases where the synovial membranes only are involved and not the bony structures the joint cavity should be injected with iodoform emulsion, formalin and glycerin, when a cure may be expected in about six weeks. He recommends additionally that fluoroscopic examination should be employed from time to time to watch the result of X-Ray treatment and that special susceptibility on the part of the patient and auto-intoxication should be carefully looked for. Regulation of the bowels and the application of all the rules of hygiene and good nutrition should be followed and plenty of light and fresh air secured. He appears to favor the use of a low tube and nearly all of his treatments appear to have been given with the tube (he does not state whether anode or outside of the glass) about seven inches from the patient's skin; treatment to be applied every day for about five or ten minutes. He considers that the presence of "Albumin in the urine, a peculiar itching in the exposed joint and profuse sweating of alkaline reaction" indicate immediate cessation of the treatment for several days.

THE TREATMENT OF TUBERCULOSIS OF THE LARYNX AND OF THE PROSTATE GLAND BY THE X-RAY, HIGH FREQUENCY CURRENTS, AND THE COOPER-HEWITT LIGHT.

Sinclair Tousey—Med. Record, Sept. 3, 1904.

The first part of this article consists of a resumé of the literature bearing upon the subject; Williams, Rivillet, Freudenthal, Stubbert, Rudis-Jicinsky, Burdick and many others being quoted.

Two cases are reported. The first one of tuberculosis of the larynx which had existed for three years with pulmonary involvement. X-Ray exposures were begun December 15th, 1903, and consisted of "Exposure to the X-Ray once every four or five days; exposure to the Cooper-Hewitt light and application of high frequency currents once in each interval between the X-Ray application;—so that on Tuesday she would be treated with the X-Ray, on Thursday with the Cooper-Hewitt light and high frequency currents, on Saturday with the X-Ray, and on the following Tuesday with the Cooper-Hewitt light and high frequency currents, etc." In three weeks, the expectoration, which had been so profuse as to choke the patient, had disappeared, and at the present time the temperature is normal, she has gained about two pounds in weight, her general condition is greatly improved as is also the ability to use her voice. The larynx was examined by Dr. Richard Kalish a few days since when he found that the area of infiltration had diminished, abrasions were healed with a whitish appearance that may be due to cicatricial tissue.

Physical examination of the chest shows "Slight dullness at the left apex, scarcely any perceptible abnormality at the right apex, and slight dullness below the angle of the left scapula, which may be due to a slight central consolidation or to a spot of pleurisy. The patinet is still under treatment."

The second case is one of tuberculosis of the prostate and was treated by allowing the light from an X-Ray tube to "Shine obliquely downward through the lower portion of the abdomen and also occasionally through the perineum.

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This application lasts about five minutes. Alternating with the perineal application, a special (Caldwell—Ed.) X-Ray tube has been introduced into the rectum. This tube is made for the most part of lead glass, which is opaque to the X-Ray. It has no anodal disk; its cathode stream is directed down from a cylindrical prolongation of transparent glass from which the X-Ray emerges in all directions. This prolongation is cooled by a continuous current passing through a water-jacket, and the application lasts only a couple of minutes. The other portion of the treatment consists in the application of high frequency currents over the lower portion of the abdomen; and in the rectum on occasions when the intrarectal X-Ray tube is not used." For several months before going under Dr. Tousey's care this patient had been radiated by another physician through the abdomen and treated by vacuum electrodes in the rectum connected directly with the X-Ray coil without the D'Arsonval transformer. For a year and a half before the X-Ray treatment was begun several large pus sacks had been formed during which time he had been unable to lie upon his back because of the pain. He had passed as much as a quart of pus in forty-eight hours and was urinating about one hundred times a day. When he came under Dr. Tousey's care in December, 1903, he was urinating twenty-five or thirty times a day and rectal examination showed the prostate to be moderately enlarged and tender. Urine looked like a mixture of blood and pus and microscopical examination showed the presence of numerous tubercle bacilli. Dr. Tousey treated him twice a week at the same time using appropriate irrigations. He has gained five pounds in weight, his general condition is much better, and no blood has been voided with the urine during the last two months. Only an occasional tubercle bacillus is now present in the urine, and he has gone five hours without urinating on several occasions lately without discomfort.

The X-Ray apparatus used by Dr. Tousey consisted of an eight-inch Wappler coil with electrolytic interrupter, a Gundelach tube of 60 cm. capacity and a Müller tube of 50 cm. capacity, provided with vacuum regulating devices, and when in use would back up a spark gap of two and three-quarter inches. The penetration of the light, as shown by Tousey's radiometer, was sufficient to shine through three thicknesses of tinfoil, of which three hundred square inches weighed an ounce. Four and one-half amperes at 110 volts pressure were passed through the primary coil. The anode of the tube was located ten inches from the patient's skin and the time of exposure was five minutes. For special applications to the larynx and rectum he used a Caldwell or Morton tube. The time of exposure with this tube was two to three minutes.

The high frequency currents were obtained from the same coil, to which was attached D'Arsonval's spiral transformer. With one pole of the spiral the patient was connected by a metallic handle; and the other pole was connected with a glass vacuum electrode, which constituted the active electrode and by means of which the current was applied to the patient.

The Cooper-Hewitt lamp was actuated by the street current of 110 volts pressure, five amperes being used. The treatment period of this application was fifteen minutes, the lamp being located five to six inches from the patient's skin.

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THE EOSINE LIGHT TREATMENT.

Prof. F. J. Pick of Prague, and Dr. K. Asahi of Japan—Berliner Klin, Woch. p. 985, 1904.

At the International Dermatological Congress just held (September 12 to 17) at Berlin the above paper was one of those to interest the readers of this journal. In order to repeat the experiments made at the clinic of Prof. von Tappeiner by Jesioneck, the authors used the sunlight (not concentrated), together with a 1 per cent solution of eosine. This solution was applied to the affected parts the day before. Altogether 22 cases were treated—12 of lupus, 1 of tuberculosis cutis verrucosa, 5 trichophyty, 3 of scrophuloderma, and I of rodent ulcer. The eosine light treatment has been, even in lupus, quite satisfactory, but the authors are far from saying that they have achieved *cures*.

THE SUBTLE POWER OF RADIUM.

Robert Abbe—Medical Record, August 27, 1904.

An interesting report of several cases which have ben treated with French radium of 300,000 and German radium designated as 1,000,000. Five cases of verrucosa vulgaris have been entirely removed by laying a capsule containing the radium upon the lesions for one hour from one to four times. In three or four days a pink zone appeared about the base of the lesion, it began to flatten and usually disappeared inside of ten days leaving a smooth skin. An ulcerating lupus of the temple in an elderly subject which had been under treatment for eight years during which it had occasionally been cured and recurred, was treated by covering the sore with gutta percha tissue and retaining a radium tube against it by bandages for an hour and a half; he was seen one month afterward with the surface entirely healed. An epithelial ulcer of the ear, one inch long and half an inch wide, which had existed for two years and had eaten away the upper rim, afforded an opportunity of comparing the action of the X-Ray with radium. One-half was treated with radium and the other half with the X-Ray for two minutes. At the sixth application radium seemed to have produced the greatest amount of healing but the whole sore healed eventually. (Inasmuch as the radium was applied for half an hour and the X-Rays for but two minutes, a time which is shorter than is ever used for therapeutic effects, we do not consider that the result of this test indicates any practical superiority of radium over the X-Ray.—Ed.)

In one case where two epithelial patches appeared on the ear of a man, one was treated with the X-Ray for two minutes and the other with radium for half an hour. Three applications of each caused absolute disappearance of both spots. About three months later the X-Rayed spot showed a slight thickening which, however, was removed by one application of two minutes. Another epithelioma of the ear which had resisted all treatment for two years was cured by six applications of the radium. Three small nodules which recurred in the scar after amputation of the breast for carcinoma were reduced 75 per cent by twenty applications of radium extending over a period of three months.

A very important case was one of giant-celled sarcoma of the lower jaw

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which occurred in a lad seventeen years old, situated just to the left of the median line and involved both the outer and inner regions. It replaced the substance of the bone except at its lower border from the middle line toward the left for an inch and a half. The tumor was one inch in thickness. Two incisor teeth and the canine were so loosely imbedded in it that they might have been pulled out with a string. A feeling of fluctuation was detectable by pressing one finger under the tongue and one outside. Two submaxillary lympathics were felt in the neck. Tumor had attained its present size in only two months. Radium was applied first to that portion under the tongue, the tube being laid upon the ulcerating surface backed by a bit of lead plate to protect the tongue. Four applications of an hour each every other day produced healthy granulation with shrinkage in the area. After eight applications the entire interior portion had become flattened and hard. For the next two weeks the applications were continued. Then the outer portion of the tumor was attacked and the mucous membrane became blistered whereupon an incision was made into the mass and the tube of radium plunged directly therein clear to the lower limit of the tumor mass. The radium was left in this situation three hours. Fifteen such treatments were given in five weeks which was followed by a progressive lessening in the bulk of the malignant mass. The loose teeth became firmer and straighter. A severe grade of inflammation attacked the skin over the tumor and the half lip producing a brawny swelling such as is commonly seen when applications of radiant energy have been carried a little too far, but it subsided kindly under soothing lotions. During the succeeding four months no treatment was given, but a shrinkage of the growth has continued and the teeth have remained firm. The walls have retracted to nearly a natural line and normal ossific changes have established themselves in the newly formed tissue. Recent examination of a small section, taken from the center of the growth, however, still shows the giant cell element.

Abbe considers it proved by his experience with radium radiation "That we have to deal with a very subtle force, unlike that of Finsen light or Roentgen rays, though strongly resembling them in effect; and efficient in some cases in which these fail. The Becquerel rays given off by radium may be rated, as much stronger than Finsen light, as they are weaker than Roentgen rays."

See also abstract in this journal, page 263.

THE EFFECT OF RADIUM RAYS ON THE COLON BACILLUS, DIPHTHERIA BACILLUS AND YEAST.

S. C. Prescott—Science, Aug. 19, 1904.

The specimen of radium used was estimated at 1,500,000 radioactivity and was enclosed in a metallic capsule having on the upper side a window covered with thin mica plate and the whole enclosed in a thin coat of rubber. This arrangement permitted easy passage for both Beta and Gamma rays. The experiment with the colon and Klebs-Loeffler bacilli were made by inoculating freshly poured agar plates from active reliable cultures and then fixing the radium capsule, mica side next the culture to be investigated, and at a distance of from

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one to two cm. from the surface of the culture. The whole was then covered with a sterilized glass bell-jar. The exposures ranged from twenty minutes to eighty minutes. The experiment with yeast was conducted in the same way except that wort-gelatine medium replaced the agar and the plates were incubated at 25 degrees instead of 37 degrees C. The most careful examination failed to reveal that any destruction or even inhibition of the life or growth of these organisms was produced.

The conclusions which Prescott draws from these experiments are as follow:

"1. Radium rays have no effect upon fresh cultures of B. coli, B. diphtheriae, or Saccharomyces cerevisiae at a distance of one centimeter when the time of exposure is less than ninety minutes.

"2. Any advantages derived from the therapeutic use of radium must be explained in some other way than by the direct weakening or destruction of the micro-organisms of disease.

"3. The use of radium tubes in the treatment of diphtheria cannot be recommended or regarded as a substitute for antitoxin."

Current Electrology and Radiology

(Only articles relating to the above named subjects will be abstracted.)

JOURNAL OF ADVANCED THERAPEUTICS.

New York, N. Y., September,, 1904.

1. Chronic Ulcers Cured by Metallic Electrolysis after the X-Ray and High Frequency Currents ha failed.—Francis B. Bishop.
2. The Dispensary Treatment of Tuberculosis—Joshua L. Barton.
3. The Complete Absorption of a Large Uterine Fibroid by X-Rays—J. E. Hett.
4. Retrospect of the Second International Congress of Electro-Therapeutics, held in Berne, (Switzerland) September 1 to 6, 1902—Robert Newman.
5. Radiography (to be contined)—Herman Grad.

1. Bishop reports a case of obstinate ulceration occurring in a woman sixty years of age, situated upon the side of the nose and under the inner canthus of the left eye, which was about the size of a silver twenty-five cent piece when she came under his observation, discharging a thick dirty pus that would dry and come off in a heavy scab. The ulcer was certainly chronic and possibly malignant. It was treated by the X-Ray to the point of producing dermatitis which caused the ulceration to spread more rapidly. High frequency currents were substituted without any beneficial results for two weeks. Despairing of getting any results with either of these agents, he then applied mercuric electrolysis according to the method recommended by Dr. G. Betton Massey of Philadelphia. Applications were made as follows: the ulceration was thoroughly cleansed, and a smooth zinc electrode well amalgamated with mercury was connected with the positive pole of a galvanic battery and held firmly against the ulcerating surface and moved around so that every portion of the surface came in contact with it, while a current of 8 milliamperes was passed. The application was continued until the whole surface of the ulceration had

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become white. Improvement began at once and after ten treatments recovery was complete. A similar ulcer had begun to form around the nipple of the left breast and on the right side of the nose. These were treated at the same time in the same way with the same result.

Bishop considers that positive zinc mercuric electrolysis should be employed wherever possible in these cases which resist the X-Ray and believes that the sum total of our power to overcome such ulcerations will be greatly increased by its use.

2. Hett reports a case of fibroid tumor of the uterus in a woman 45 years old, which had existed for 12 years and had caused the patient much suffering from pain, pressure sensations, and hemorrhage; the general health was much impaired. The growth filled the whole abdomen, extended above the umbilicus and was of the intramural, multinodular type. Patient had refused operation but consented to have the X-Rays applied. She was given daily treatments through the abdominal wall for twenty-three days, treatment lasting fifteen minutes, a hard tube being used, located fifteen inches distant from the patient's skin (whether this refers to the anode or the glass of the tube is not stated); tube was excited by a 16-plate Wimshurst static machine. Vaseline was applied freely to the abdomen for protection against burns. Slight dermatitis showed itself at the end of 23 days when the treatment was suspended for 10 days, redness disappearing in the interval. Ten more treatments were then given and the patient advised to return home and await results, no diminution of the growth having been noticed, but the skin had become slightly tanned. The hemorrhages, however, had ceased and there was less pain.

After she returned home a burn developed which Dr. J. G. Smith of Hintonbury, Ontario, was called upon to treat. The subsequent course of the case is well expressed by Dr. Smith's report, which Dr. Hett includes in his article as follows: "One week after arriving home, March 13, 1903, I visited Mrs. H—— and found her suffering from a burn between umbilicus and pubes slightly larger than the size of a man's hand. She suffered intense pain. Tried all the remedies I could think of in my endeavor to relieve pain and bring about healing. In spite of everything used the pain continued constant, and the wound healed very slowly. When the wound was about 2½x2½ inches the healing stopped and the pain became unbearable. I advised thorough scraping of the wound. Under chloroform proposed to do this, but finding a thick sole-leather-like substance, concluded it better to excise the entire surface, which I did; cutting down to the healthy tissue. The substance removed was from ¼ to ½ inch in thickness, very dense, and of an ash-brown color. The sharp, lancinating pain ceased immediately, the wound took on a healthy look, and slowly closed in. As regards the fibroid; the hemorrhage ceased, the pressure symptoms are gone, and the tumor mass has disappeared. At the present time, she enjoys splendid health and says she has never been better in her life. She certainly looks it

Hett believes that his experience with these cases demonstrate the uselessness of vaseline and celluloid as protectives against X-Ray burns. "And that further experiments on uterine fibroids will demonstrate that these growths will disappear under X-Ray therapy."

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4. There were 125 subscribers to this Congress, of whom 64 were present and took part in the presentation and discussion of papers. Seventy-nine papers were presented, 51 in French, 24 in German, 3 in Italian, and 1 in English. The only man present from the United States was Dr. A. W. Bayliss of Buffalo, N. Y., who was the delegate from the American Electro-Therapeutic Association. A very successful exhibition of electro-therapeutical armamentaria was held in the rooms of the Physiological Institute in the Berne University. The principal interest seemed to be centered in X-Ray tubes and apparatus. Twenty German, 6 Swiss, 5 French, 4 Austro-Hungarian, and 1 Spanish manufacturers presented exhibits.

5. This article consists of the advance sheets of the chapter on radiography and radiotherapy which will appear in "Conservative Gynaecology" by Dr. G. Betton Massey of Philadelphia, to be published soon by the F. A. Davis Co. of Philadelphia. The static machine, induction coil, fluoroscope, photographic plate, together with its development and the apparatus required therein, and the vacuum tube for the production of X-Rays are described in the satisfactory manner characteristic of the author but with great brevity. Nothing new is presented.

ARCHIVES OF THE ROENTGEN RAY.

London, England, August, 1904.

1. **Lectures to Medical Practitioners on Physics Applied to Medicine. Lecture VI. High Frequency Currents and Radium—Sir Oliver Lodge.**
2. **High Frequency Currents: Some Infective Diseases Amenable to Treatment, (to be continued)—Clarence A. Wright.**

2. In this, the last of Dr. Lodge's wonderfully interesting course of lectures, he explains with great clearness the various forms in which electrical energy may be produced and shows just how each one may be applied to the human body, stating the general objective results, but without going in detail into the physiology or the therapeutics of the subject. He frequently calls attention to his own experiments of a decade or more ago and shows what great significance should be attached to some of his early conclusions in the light of modern therapeutics.

Alternating currents of low frequency, say 100 per second, are justly thought most dangerous while those of high frequency, i. e., of say 1,000,000 per second, may produce no appreciable effect whatever. The chief reasons for this are, that the duration of an impulse in a single direction is not long enough to permit the parts of a molecule to separate and so no chemical changes can occur, and that currents of very high frequency are much confined to the surfaces of conductors, and so in the case of the body the vital parts are not reached to any great extent. Dr. Lodge makes quite clear that what is now known as the high frequency or the D'Arsonval current is the "B" circuit discharge described in detail in a former lecture. The effect of such a current on frog's "nerve-muscle" preparations is shown and differences pointed out between such effect and that produced by a very low voltage source of direct current. It is strongly suggested that the ozone which results from the brush discharges in many of

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the experiments discussed is quite to be avoided as producing inflammation of the nasal mucous membrane. The terms "electron" and "ion" as distinguished from atom and molecule are defined with exactness from the standpoint of modern physics. An "electron" in mass about the eighth hundredth part of that of a hydrogen atom, signifies the unit or atom of electricity, the negative one only being at present known. It has a speed comparable to that of light and to it all electrical phenomena are due.

By an "ion" is meant what an atom becomes when it is associated with too many or too few electrons, being thereby negatively and positively charged, respectively, the normal atom being an aggregation of electrons, the number depending on the substance. Ions are the agents in all chemical phenomena. Ionization consists in jarring by sudden blows or jerks atoms or molecules so as to leave them with an unusual number of electrons.

The X-Rays ionize air in their passage through it. Radium atoms are spontaneously ionized, i. e., they eject electrons and then the residue separates into parts, these pieces being identical with the atoms of some other substance.

The diagrams made to illustrate the relations of the various induced transformations of electrical energy beginning with a simple voltaic circuit are most instructive and lucid. For convenience the steps are denoted, voltaic, faradic, D'Arsonval (high frequency or B circuit) and the Tesla circuits, the last having by far the highest frequency.

As experimenting with these enormous voltages is sometimes attended with much danger of shock, a timely warning is given not to give a victim of accident up for dead till every artificial means of restoring respiration and heart action has been tried and that, too, for a longer period than usual.

ARCHIVES OF THE ROENTGEN RAY.

London, England, September, 1904.

7. **The treatment of some Skin Diseases by X-Rays—Harold E. Gamlen.**
2. **The Record of an Attempt to Treat Psoriasis With X-Rays—With Example—Harold E. Gamlen.**
3. **On The Diagnosis of Partial Pneumothorax by The Roentgen Ray—Hugh Walsham.**
4. **High Freguency Currents, Some Diseases Amenable to Treatment—(To Be Continued)—Clarence A. Wright.**

1. Gamlen's experience leads him to feel "That all cases of chronic eczema, no matter how intractable or of how long standing, can be entirely eradicated by means of the X-Ray in a period of two months," and believes that this statement will apply to acute as well as chronic cases. Parasitic eczema which is particularly intractable to ordinary treatment he considers to be especially amenable to X-Ray therapy. One of the first effects of the X-Ray application is relief of the painful irritation. Some of his cases have remained cured for fourteen months and he believes that these cures are permanent. He uses a low tube, secures a fairly severe reaction as soon as possible and after the reaction subsides the eczema is found to have disappeared. No accessory medicines or local applications are considered necessary, but water should not be applied to the part under treatment, as it intensifies the dermatitis and delays the cure. General high frequency applications are administered synchronously with the X-Rays for their tonic effect.

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Eight cases of eczema, which had resisted other treatment, including high frequency currents, upon various parts of the body, one of sycosis, three of alopecia areata, and one of keloid are reported as cured.

The treaments appear to last for ten minutes each and to be applied from once to thrice weekly. Distance of anode from skin is not given.

The cases of alopecia are particularly interesting, inasmuch as the contention has been raised by many that the X-Rays are useless in this condition. These cases of Dr. Gamlen's prove the contrary, and although iodine ointment was also employed, this does not detract from the value of the X-Rays, because iodine ointment has not been very effective in this disease when employed without the X-Rays.

2. Gamlen considers that all skin manifestations of psoriasis, no matter how severe, can be entirely eradicated by the X-Ray treatment, but has not had cases under observation long enough to feel justified in stating that such cure will be permanent. He uses a low tube with sittings of fifteen minutes' duration, frequency of application three times a week, with the anode situated ten inches from the patient's skin; he aims to produce dermatitis, with the subsidence of which the psoriasis disappears. He gives general high frequency applications synchronously with the X-Ray applications to improve the tone of the constitution, but does not consider this to be indispensable for the success of the treatment. A case is reported which had existed intermittently for nineteen years, resisting every other kind of treatment, and which was entirely cured by twelve twenty-minute X-Ray applications preceded by the same number of general high-frequency applications upon twelve consecutive days, when severe reaction became manifest which was carried to the point of blistering on some portions of the exposed areas; when this reaction subsided the psoriasis was entirely cured.

3. Although pneumothorax is not difficult to diagnosticate if the classical physical signs are present, yet many cases are met with in which these physical signs are not present, and in these Walsham considers that the X-Rays will be of the greatest possible utility. He reports one such case, exhibiting the skiagraph before and after recovery, which is very instructive. The case is also interesting because it recovered entirely in one week.

4. This article was begun in the June number. Wright considers that the therapeutic influence of the high-frequency currents is now well established and that the only question to be raised is the suitability in certain forms of disease of the individual methods; it also remains to point out the various diseases in which the treatment is effective.

Tuberculosis is by far the most important of these, and although the sanitorium treatment has been productive of good results, yet this is available only for the moneyed classes and a very few selected cases from the poorer classes. It is mocking their wretchedness to recommend to the laboring classes that they procure pure air, sunlight and abundant food, and it is these three factors which constitute the principal reliance in the sanitorium treatment. He considers that the necessity of the times demands much more active and vigilant measures than mere prophylaxis and a regime in which everything is left to the "vis mediatrix naturae." He also considers that after the disease has established itself, active

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therapeutical measures are needed which reinforce the constitutional resistance before the patient can cope with the tubercle bacillus, and that the ordinary drug tonics are insufficient to effect a proper degree of constitutional stimulation. The sanitorium treatment fails us in at least two important particulars; first, its want of general applicability, and second, in not furnishing a specific remedy or agent whereby the activity of the bacilli can be directly counteracted. Three important factors, active in the beneficial influence traceable to the sanitorium treatment, are the presence of ozone, the chemically active ultraviolet rays of light, and increased capacity for assimilation engendered by residence at high altitudes. The high frequency applications result in the generation of an abundant quantity of ozone in the nascent condition, and ultraviolet rays, by effluvation, in greater abundance than in the sanitorium treatment, but the power of assimilation and nutrition are even more directly influenced by high frequency currents than by the inactive rest which forms a part of the sanitorium treatment. In addition high frequency currents are applicable to all cases.

Lagriffoul and Denoyes' experiments upon guinea pigs which had been experimentally inoculated with tuberculosis are quoted and the following results noted. Effluvation was given for five minutes three times a week, but did not always prevent generalization of the infection; the effect of auto-conduction in general seems less accentuated than that of effluvation; a combination of effluvation and auto-conduction does not appear to accentuate the effects produced by either of these two methods when used alone. It was found during these experiments that the advance of the disease was retarded, lesions being less marked in the animals that were trated than in those that were not. The results of these experiments may be considered to clearly establish a favorable influence of high frequency electricity over tuberculous lesions.

The acute pneumonic form of pulmonary tuberculosis characterized by rapid consolidation of the lung tissue and high temperature is not suited to this treatment, only the chronic forms and especially those which are characterized by fibrosis. Continuance of the fever, repeated hemorrhages, and renal lesions are the only contraindications at present known. From a study of the technique of French operators, Wright appears to favor the effluvation of those portions of the lungs which are affected, by a resonator current as powerful as can be obtained and these applications are sometimes applied with such intensity as to produce blistering. The sessions should occur pretty frequently, every one or two days, in fact, and may be applied either to the back or front of the chest. Some operators prefer not to make applications to the front of the chest, especially with cases of the hemorrhagic type, as in such conditions inhalations of ozone may be looked upon as harmful.

The symptoms do not disapnear with equal rapidity, usually the night sweats and evening temperature being the first to diminish, emaciation, cough and expectoration next, and the stethoscopic findings sometimes persist even after treatment has been suspended. Tubercle bacilli disappear from the sputum late in the treatment but sometimes return again, finally disappearing altogether and permanently. The appetite usually begins to improve about the fifteenth session. The increase in body weight in one of Oudin's cases amounted to 12 kilograms.

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As intimated above the cases should be selected for this treatment, those having persistent high temperature and hemorrhages not being considered suitable. If hemorrhages or high temperature occur during courses of treatment the applications should be suspended until these symptoms subside.

Six cases treated by Drs. Doumer and Oudin of Paris, France, are reported in detail and constitute most instructive and interesting reading. The results obtained are very striking, amounting practically to absolute cures of the cases. The article is to be continued in future issues.

ARCHIVES D'ELECTRICITE MEDICALE.

Bordeaux, France, August 25, 1904.

1. **Order of Transparency of Urinary Calculi; After the Laws of Benoist and the Experimental Method—M. Maingot.**
2. **A Case of Lymphosarcoma Rapidly Improved by The X-Ray—J. Bergonie.**
3. **Physiological and Pathological Action of The Products of Radium—E. S. London.**

1. Benoist has formulated some very important laws which permit numerical application. Simple bodies possess always the same degree of transparency without regard to their physical state or the chemical combinations into which they enter. Benoist expresses the "Degree of Transparency" of a body by the weight in decigrams of a section one centimeter square and of such a thickness that the transparency shall equal that of a layer of paraffin 75 mm. thick. The following is the applied formula:

$$\frac{M}{E} = \frac{m}{e} + \frac{m'}{e'} + \frac{m''}{e''}$$

In this M, m, m', m'' represent the masses of the single constituents, and E, e, e', e'' their respective degree of transparency. This applied by Gastex to substances susceptible of forming urinary calculi gave the tabulated results:

Ammonium urate,	$C_5 H_7 N_5 O_3$	55,9
Uric acid,	$C_5 H_4 N_4 O_3$	55,3
Magnesium urate,	$C_{10} H_6 N_8 O_6$	55,9
Sodium urate,	$C_5 H_3 N_4 O_4$	50,7
Calcium urate,	$C_{10} B_6 N_8 O_6 Ca$	28,8
Ammonio-magnesium phosphate,	$PO_4 Mg N H_4$	27,4
Calcium oxalate,	$C_2 O_4 Ca$	14,5
Bicalcium phosphate,	$(PO_4)_2 H_2 Ca_2$	12,7
Calcium carbonate,	$CO_3 Ca$	12,1
Tricalcium phosphate,	$(PO_4)_2 Ca$	11

On account of impurities and mode of formation of urinary calculi it is impossible to speak of equivalent transparency. It is interesting to verify experimentally whether the classification obtained after the laws of Benoist is applicable to calculi having about the same chemical composition.

Calculi were cut into discs 74 mm. in thickness, first with a saw and then polished down to required thickness with emery. These were mounted and

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radiographed with rays of 4 and 9 penetration, according to the Benoist radiochrometer. According to the analysis these substances group themselves in the following order:

1. Uric acid.
2. Uric acid (traces of calcium urate).
3. Calcium and magnesium urate.
4, 5, 6, 7. Ammonio-magnesium phosphate.
8. Uric acid + calcium oxalate + calcium carbonate + ammonio-magnesium phosphate.
9. Ammonio-magnesium phosphate + calcium phosphate.
10. Ammonio-magnesium phosphate + calcium oxalate + calcium carbonate.
11. Calcium urate + ammonio-magnesium phosphate + calcium carbonate.
12. Calcium oxalate + ammonio-magnesium phosphate.
13. Calcium and magnesium phosphate.
14. Calcium oxalate.
15. Calcium oxalate.
16. Calcium phosphate.
17. Calcium phosphate.

The calculus of calcium carbonate were present. These results agree with Benoist's classification. We must conclude that the small amount of foreign material in these calculi is of no consequence in this classification.

2. The patient, aged 28 years, has some tumors on the side of his neck which have been continually increasing in size for the last two years. He has been treated, principally by injections, for tuberculosis, malignant tumors and syphilis. When treatment was begun, June 8, patient was weak, dyspnoeic. He had large masses on each side of his neck, masses in the axillae preventing the vertical position of the arm, and a mass extending from the third to the sixth rib irregular in shape and painful. Collateral circulation greatly increased, splenic region painful and tumorous, pulse weak, respiration painful, face emaciated and anxious, diarrhoea was present, lungs congested, left one opaque under radioscope, patient very thin. Blood examination shows anaemia and marked leucocytosis.

Diagnosis—Lymphosarcoma.

Treatment—Tube Chabaud-Villard with covered anticathode fed by a coil giving a 50 cm. spark, on a public main current using an interruptor. Anticathode held 15 cm. from skin; five minute applications. Rays were number 7 according to the Benoist radiochrometer, and quantity per application about 4 to 6 π by the Holzknecht table. Daily applications were given but in eight different places, giving an average of four times a month for each region affected. After three days patient feels better. After eight days respiration is improved, appetite better, tumors somewhat softer. Sputum showed simple tracheo-bronchitis. June 27, blood showed increased red corpuscles, diminution of whites, a tendency to return to normal count. Tumors were greatly diminished in size in all regions. Patient has good appetite, is gaining in weight, dyspnoea has entirely disappeared. Left lung is transparent. Right still shows

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streaks of opacity. Improvement is marked in the axillae and the region of the spleen.

These results not only show the marked effect on the tumors, but also the effect of the X-Ray on the blood.

3. A. Action on Bacteria.—Experimental results show that radium acts on bacteria; (1) directly according to the quantity of radium; (2) more intense action by Alpha rays, weaker by Beta rays and weakest by Gamma rays. Also action varies directly as the distance of the radium from the bacteria and that action is more intense on cultures uncovered than on those covered.

B. Action on Mushrooms.—Dauphin finds that: (1) radium checks the growth of mycelium and prevents the vegetation of spores; (2) in the stem of the mycelium are formed organs of defense; (3) neither spores or mycelium perish, but become latent, capable of growing when transplanted.

C. Action on Ferments, toxins, and Antitoxins.—Radium does not materially influence the activity of chymosin, invertin, emulsin, serpent venom, hemolysin, typical agglutinin; it has no effect on pepsin, salieïn and diphtheria toxin. It has no effect on the rapidity of coagulation of blood or milk, nor on the rapidity of digestion of albumin by trypsin.

D. Action on Plants.—Radium retards the growth of young plants. Radium left near a leaf of tradescontia virginica for a short time burned a spot into it.

E. Action on Embryos and Low Forms of Life.—Radium retards the growth of these forms.

F. Action of Higher Life.—Radium caused paralysis in higher animals, such as mice. It stimulates the spinal cord on direct application. Later it diminishes sensibility.

G. Action on the Eye.—Radium gives (1) a sensation of light; (2) does not increase visual faculty; (3) rays are absorbed by the eye; (4) exposure may cause atrophy or inflammation; (5) it may act directly on the visual apparatus; (6) rays may be absorbed by shaded eyes; (7) gives the results known as the "silhouette method" when acting on a plate of platino-cyanide.

H. Action on the Skin.—Radium burns the skin. Such wounds cicatrize slowly.

I. Physiological Action.—Radium has a soluble action on albumins; it transforms haemoglobin into methaemoglobin.

J. Practical Application.—Radium is used in treating tumors of various kinds. Its action is not very well understood. There is a theory that it either excites the growth of the stroma or that it destroys the cell.

K. General Importance of the Study of Radioactivity for Biology.—It is of the utmost importance since all bodies are radioactive. The application of this belongs to future researches.

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JOURNAL DE PHYSIOTHERAPIE.

Paris, France, August 15, 1904.

1. X-Rays and Constipation—Dr. E. Albert Weil.
2. On a Case of Epithelioma of the Temporo-Frontal Region Cured by The Application of The X-Rays—MM. Ch. Monod and Bouchet.
3. Note on The Mechanical Treatment of Oedemas—Dr. Charles Columbo.
4. Pelvic Pains—Docteur Rene de Langenhagen.

1. The analgesic and decongesting effects of X-Rays are well known to-day, also their action in suppressing neuralgias and cramps, and in resolving oedemas. These facts have let the author to recommend the X-Ray treatment of constipation. His mode of action has been as follows: Using a Rochefort transformer, a Driessler tube, and a localizing apparatus bearing a guard cylinder, he submits to radiotherapy circular cutaneous areas five centimeters in diameter situated below a horizontal line passed through the umbilicus. In general the exposures have been made on the skin situated in the iliac fossa. The maximum number of rays compatible with the integrity of the skin were used from 4.... to 4½ ..... Rays marked 6 or 7 according to the radiochrometer of Benoist were employed. Gratifying results were obtained even as early as the first exposure. In one of the most typical cases, a woman with a large fibroma, there was a daily stool after an exposure to 5 .... rays, when hitherto the most violent purgatives and enemas gave negative or absolutely insignificant results. The same happy results have been obtained in young women free from all genital lesions but subject to chronic constipation, nervous in origin. After the second treatment the stools were spontaneous. The action of the X-Rays is probably on the abdominal nerve plexuses.

2. Patient, aged 53, presented last March. Malady began ten years ago as a small wart, increasing from year to year. In August, 1903, it began to ulcerate and since then has grown rapidly. The ulcerated portion is larger than a five-franc piece, is firmly attached to the periosteum beneath, and is the seat of frequent spontaneous hemorrhages. The neighboring glands are enlarged. The diagnosis of cutaneous and subcutaneous epithelioma was confirmed by histologic examination. Short repeated exposures of medium intensity were tried. After the first application the hemorrhages ceased. A cicatrical tissue rapidly appeared, and three months after the beginning of treatment a cure seems certain. A second histologic examination showed absence of cancer cells. The writer used a Gaiffe static machine with eight plates, a Chabaud tube and osmoregulator. Exposures were given every two days, 35 in all being given. The treatment began with an exposure of 30 seconds increasing this by 30 seconds each time until exposures of five minutes' duration were reached. This treatment was twice interrupted for eight days following slight burns. A weak tube with a spark equivalent to 4 cm. was used. During the 25 first exposures the tube was placed 5 cm. from the patient, and the intact tissues protected by a plate of lead. Since the 25th exposure the tube has been inclosed in a sort of funnel of glass over lead. This funnel has some openings of different diameters permitting a modification in size of the orifice in proportion to the area treated. The anticathode was held at a distance of 22 cm. from the part exposed. The tube gave rays No. 6 according to the radiochrometer of Benoist. The treatment was un-

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eventful except for some slight burns. The danger of burns increases with the number of plates used. It is better to give short and frequent exposures. This patient received in all exposures amounting to about seventy minutes.

Book Reviews.

THE SUCCESS OF THE ROENTGENTHERAPY.

By Professor Eduard Schiff. Vienna, 1904.

Published by Moritz Perles, Vienna, Austria.

As Prof. Schiff was the first to introduce the application of X-Rays in the treatment of lupus, he has a right to discuss this first part of his brochure with some authority. After him his assistant, Dr. Freund, used them and then Kuemmel, Gocht and especially Albers-Schoenberg. Schiff gives the histories of 4 additional cases treated in that manner and concludes this part of his work by saying that the success with that therapy in lupus is without doubt.

The second part is devoted to the literature and discussion of X-Ray treatment in malignant neoplasms, rodent ulcers, etc. While we cannot agree with the optimistic views laid down in that more elaborate part, we have to admit that even the American reader, whose desk has been flooded with articles on X-Rays will read this booklet with some interest.

ROENTGEN RAY DIAGNOSIS AND THERAPY.

By Carl Beck, M. D.

Professor of Surgery in the New York Post-Graduate Medical School and Hospital, etc. Octave, Cloth, $4.00. D. Appleton & Co., 436 Fifth Avenue, New York, Publishers.

No man has done more to develop the Roentgen ray into a useful and reliable diagnostic agent or to disseminate knowledge of the same than the author of this book, and combining, as he does, with his knowledge of the Roentgen ray an extensive and profound knowledge of the theory and practice of surgery, we should expect a production of unusual merit from his pen. The present volume of 460 pages is fully up to that expectation and constitutes a most valuable addition to the X-Ray literature of the present time.

The first section of 64 pages treats of apparatus, technique, general manipulation of the patient, etc.; the second section, containing 295 pages, treats of the diagnostic use of the ray and here the author's genius and art in handling his subject stand forth pre-eminently. Each region of the body and each joint is dealt with separately and variations in technique which are advantageous in the investigation of these different portions of the body are described fully but tersely in the appropriate sections. Clinical reports and numerous illustrations illuminate the text with a degree of lucidity which makes this section one of the best expositions of Roentgen ray diagnosis yet published. The last chapter of this section is upon "The Medico-Legal Aspect of the Roentgen Rays," and sets forth the

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various errors into which one is likely to fall through faulty technique in making the skiagraph or unskillful interpretation thereof. The third and last section is given up to a brief but comprehensive summary of the physiological and clinical effects upon the body tissue, normal and pathological, and pathogenic micro-organisms of the Roentgen rays, radium rays, and the Finsen light, and sets forth most satisfactorily what is at present known about these subjects. The work will not only be of value to those who are already familiar with the X-Ray but also to those who desire only to become familiar with the general capabilities of this agent.

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Archives of Electrology and Radiology

Vol. IV November, 1904 No. 11

Original Contributions.

SOME OBSERVATIONS ON THE MEDICAL USES OF THE CONTINUOUS (GALVANIC) CURRENT.*

By Daniel R. Brower, A. M., M. D., LL. D.
of Chicago, Ill.
Professor of Nervous and Mental Diseases, Rush Medical College.

A study of the current medical literature and of the proceedings of this and kindred societies leads me to the conclusion that the profession is drifting away from the medical uses of the continuous current. This is probably due to the great improvements that have been made in static machines during the last few years, in the discovery of the X-ray, and in the introduction of the high frequency, high potential current. These several agents are so much more convenient to use, and have such a striking effect that we are losing sight of the advantages of the direct and constant current that does its work so quietly. Some of this may be due also to the disappointment that has come to the members of the craft by their using as the source of the continuous current a dynamo rather than chemical action. The current from the dynamo is pulsating; that from the chemical action is steady. And this difference is very important when a very sensitive patient is under treatment. And then, again, the ordinary rheostats used in the physician's office do not reduce amperage and voltage *pari passu*, and this also gives annoyance to sensitive patients. For cerebral applications especially, it is important that the current should be steady, that it should be of low amperage and of low voltage; but, on the contrary, if the case be one of inflammatory exudates in joints or tendons, for example, there is some clinical advantage in using the pulsating form of the direct continuous current, for a much quicker result can in this way sometimes be attained.

Valuable research work has been done recently by Stewart, of England, and by Cleaves, of our own society, on the chemico-physical action of this current, and Dr. Cleaves thus sums up in an admirable series of articles that she is publishing in the Journal of Advanced Therapeutics her results:

"The first effect is the chemical effect of the products liberated by the electrodes or in the substance of the tissues.

*Read at the Fourteenth Annual Meeting of the American Electro-Therapeutic Association at St. Louis, Mo. Sept. 13 to 16, 1904, and published in this Journal by special permission of the author and the Executive Council of the Association.

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"The second effect is due to the removal of the electrolytes, chiefly inorganic substances, which are necessary for the vitality of the tissues, leading to increased absorption of the elements, and perhaps in consequence to increased activity of the general nutrition in the tissues, degeneration or death.

"The third effect is that which results from cataphoresis, leading to increase of transferred substances around the cathode and to their diminution around the anode and consequent increase of elimination or absorbing activity by which the tissue returns to healthy equilibrium or to any of the results which follow the disturbance of equilibrium beyond limits of health.

"And, lastly, is the effect that results from raising local temperature."

The physiological and general therapeutic effects of the current have been summarized by another of our *confreres,* Dr. W. J. Herdman, of Ann Arbor, Mich.,* and I take the liberty of presenting this *in extenso* in the doctor's own words:

"It causes contraction of muscular tissue both of the striped and unstriped varieties, and invigorates the processes which depend upon this muscular activity —the circulation of the blood and lymph, intestinal peristalsis, muscular contraction of the bladder, uterus, etc.

It is thus *tonic, stimulant, purgative,* and *eliminant.*

"By its action nutritive material may be conveyed in greater abundance to the tissues needing it, and the metabolism of the tissues may be quickened. Thus it is *alterative, constructive,* and *restorative.*

"Through its influence on the muscular walls of the intestines, the uterus, and excreting organs and blood-vessels elimination is promoted, and the irregular distribution of blood as in hypostasis and passive congestion is overcome. Thus it is *purgative, diuretic, oxytoxic, eliminant.*

"By means of it exudates and neoplasms are broken up by electrolysis and prepared for removal. Thus it is both *destructive* and *eliminant* to injurious and useless products.

"By its aid morbid fluids and substances in solution in them are removed from the tissues of the body and remedies in solution may be brought into them. *Elimination* and *medication* by phoresis.

"It is both directly and indirectly germicidal because of its electrolytic action, and gives promise, in the results of recent experiments, of a capacity to transform toxins into antitoxins. Thus it is *antitoxic, antiseptic, disinfectant.*

"The local effects of the anode of a constant current upon nerve tissues is such as to diminish its excitability, giving an action *sedative, analgesic, antispasmodic.*"

These conclusions of our two confreres as to chemico-physical, physiological and therapeutic properties cannot be gainsaid by any careful and conscientious student of the topic. And it is surprising that there should be so many in the profession who are unwilling to admit anything in the medical uses of this powerful agent except such as is the result of suggestion. They tell us that it is all psychic; that this power, which has become such a factor in the economics of the day (and this has been well styled the electric age), so that everywhere around

*Journal of Advanced Therapeutics, Vol. 22, No. 3. page 136.

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us its usefulness has made it a necessity, so that commerce and manufactories are so absolutely dependent upon it, that their forces would stop if the world were deprived of its use—that such a power some would have us believe has no more effect upon the human body of a curative character than such as is purely mental, or than such as might come from the use of Christian Science or Dowieism.

The first observation upon the medical uses of this agent will be in connection with diagnosis. The value of the continued current here is not questioned even by the most skeptical of physicians. Take exophthalmic goitre, a disease that is easily diagnosed when its three cardinal symptoms are present, even by the merest tyro in medicine. But when there is no exophthalmos, and a very slight thyroid enlargement, and with but little tachycardia, the diagnosis is difficult, and in some of these cases we are enabled to make an earlier diagnosis and to clear up the doubts and uncertainties of the cases by the use of this current; for in a large proportion of them the electrical resistance of the body is so markedly diminished that there is no difficulty in determining it.

In tetany, the diagnosis is usually readily made, but in certain cases its differentiation from hysteria is by no means easy. The galvanic current here assists us materially because in this disease there is almost invariably a great increase of excitability. In a doubtful case of this sort I was enabled to clear up the matter by testing the median nerve and obtaining response with less than half the current of Stintzine's tables and by being able to produce without difficulty anodal duration tetanus.

The changes in electrical reactions of nerves and muscles enable us to differentiate the atrophies of disuse and the myopathic muscular atrophies from organic nerve disease. The qualitative changes giving us the reaction of degeneration are easily determined, and when they are found we know that the muscle has been separated by some process from its trophic center, and then we know that the lesion is in the lower motor neuron. It is true, that this conclusion may often be reached by other methods of investigation, but in certain doubtful cases its presence or its absence will be of great value to the diagnostician.

A laborer fell from a scaffold, striking on his head, producing a lacerated wound of the scalp. He was taken to the hospital unconscious. When he regained consciousness he was found to be paralyzed in the right arm. There was a difference of opinion as to the seat of the lesion, and this difference of opinion was settled most conclusively by finding in a few days after the accident the reaction of degeneration in several muscles, establishing the case as a peripheral injury, and not a cerebral one. This reaction of degeneration also enables us often to differentiate in medico-legal cases the monoplegias of the hysterical or psychic types, resulting from trauma and so closely resembling organic disease,

As to the therapeutic uses of the agent, I would first call your attention for a moment to its use in cerebral diseases and preface what I may have to say by quoting from an interesting lecture on cerebral galvanization by Professor C. Le Duc,* of the School of Medicine of Nantes:

1. The brain is quite accessible by the battery current.

*Arch. d'Electricite Medicale, May, 1899.

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2. Applications to the brain are free from danger and, if carefully applied, are free from discomfort.

3. Negative applications appear to excite the functions of the brain, while positive seem to have a calming and depressing action.

4. There is reason to hope for good effects in many diseases of the brain.

5. Negative applications afford a means, probably the best means, of relieving the effects of mental overwork and of raising the intellectual powers to their highest level.

Notwithstanding these deductions of Prof. Le Duc and those of other distinguished students of this important topic, we have in the profession numerous distinguished physicians who are not willing to admit that a galvanic current can be made to traverse the brain at all, forgetting that electricity in its activities always follows the route of least resistance, and when the electrodes are applied, one to the nucha, and one to the forehead, the route of least resistance is through the brain, because the blood vessels are the best conductors, and every one knows the close and intimate anatomical relations between the vessels of the scalp, the diploë, the meninges, and the brain. And why this current should go round the head and not through it under these circumstances is more than I can understand; and then we have those striking symptoms of which patients complain if we are not sufficiently careful in its application that could only be the result of irritation of the cerebral tissue.

Cerebral syphilis is greatly benefited by the use of a mild galvanic current, not exceeding two milliamperes, the positive electrode, three inches by six, applied to the forehead, and another (negative) of about the same size, to the nucha, the current to continue for about ten minutes and to be applied daily. This treatment, with the hypodermic use of the bichloride of mercury into the gluteal muscles, and as large doses of the iodide of potassium by the mouth as the patient will tolerate, will yield very much more rapid results than the treatment by medicine alone. My clinical experience in this direction is sufficient to enable me to make this assertion with the greatest amount of confidence.

Cerebral neurasthenia is another perplexing problem in therapeutics that will yield more promptly if we use cerebral galvanization by the method that has just been described along with careful attention to elimination, the use of readily assimilable preparations of phosphorus, and a judicious combination of rest and activity. I am very sure that my clinical observations in the use of cerebral galvanization enable me to endorse the general conclusions reached by the late Dr. failure of brain power; and I desire also to emphasize the observations of Prof. Le Duc, that the positive electrode has a calming or depressing action when applied Julius Althaus* on the value of mild galvanic currents for the relief of the to the forehead, and the negative has the contrary effect.

Cerebral paralysis especially that due to hemorrhage, is also benefited by the judicious use of the galvanic current; not that electricity or any other agent can restore parts that have been destroyed, but the paralysis that follows a hemorrhage is always much more extensive than the actual destruction of nerve fibers, for roundabout the hemorrhagic focus the tissues are in a state of collateral oedema,

*On Failure of Brain Power, 1898.

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and many fibers cannot functionate because of this pathological condition, and anything that relieves it promptly will restore power. For this purpose we use internally the administration of alteratives, and electricity is an alterative. A galvanic current, not exceeding two milliamperes of strength, with a large electrode, should be used longitudinally and transversely in ordinary cases not later than three weeks after the onset, and at the same seance at which galvanism is used for the purpose indicated, the nutrition of the muscles of the paralyzed members should be kept from undergoing the atrophy of disuse by their daily exercise with a mild faradic current; and if the muscles are kept in a state of good nutrition, and if the pathological products that surround the hemorrhagic focus are promptly removed, we shall get much better results than is possible by any other method which we may adopt.

I can also bear testimony to the advantage of cerebral galvanization by these mild currents in certain of the psychoses, especially in acute cases of melancholia and confusional insanity.

That organic spinal cord disease that gives the most striking results from the use of electricity is poliomyelitis anterior acuta. If the paralyzed muscles can be made to contract by a current that the child can be induced to tolerate daily, and if this muscular contraction is accompanied by the use of massage and by attention to the general health, using such restoratives as may be indicated, and paying proper attention to elimination, we will obtain better results than can be otherwise secured. The difficulty in the treatment of these cases is to induce the mothers of the children to continue the treatment for a sufficient length of time. The progress must necessarily be slow, but where muscles will respond to currents of moderate amperage, the restoration of power is always a possibility, and failures result from the want of earnestness and persistence on the part of the doctor or the friends of patients. This treatment, to produce the best results, should be used very early in every case.

The most brilliant results in the treatment of diseases of the nervous system, I think, are had in the cases of multiple neuritis. Here the continuous current should be used immediately, when the diagnosis has been made, to the nerve trunks, using, if necessary, on account of pain, cocaine by cataphoresis. The positive electrode, without cataphoresis, applied with gentle currents, four to five milliamperes to the nerve trunks, will always produce sedation, and this sedation, I believe, is also accompanied by physical effects in the direction of limitation of the degenerative process. When the excessive pain has subsided, then the current, used interruptedly to the atrophied muscles of such strength as will produce contraction, will begin the work of restoration in their nutrition. In thus applying the current to the atrophied muscles, we must always bear in mind that too strong a current, or too frequent application to a particular muscle or group of muscles, may result in exhaustion so that in the beginning of the treatment a single muscular contraction of each muscle or group of muscles at each seance is all that is necessary, and if this treatment is accompanied by mild alteratives and tonics, surprising results may often be had in the most unpromising cases, and this often after a long persistence of the disease. I should not hesitate to treat any case of multiple neuritis in which muscular response can be had by currents of

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moderate intensity with the positive assurance of benefiting the patient. What is true of multiple neuritis is also true, to a very large extent, of peripheral paralysis generally.

Facial paralysis of peripheral origin is a most encouraging condition to treat. We should begin by using a current of low amperage, stable, using the positive electrode over the peripheral distribution of the nerve in the face, and the negative at the nucha. After a week or ten days of such daily treatment the electrical exercise of the muscles should be commenced, and a current of just sufficient amperage should be used to produce gentle contraction, and a single contraction is enough at each seance. This treatment should be supplemented by daily facial massage and by the use of an artificial muscle made by using a hook-shaped piece of hard rubber, placed in a corner of the mouth, with a flexible rubber band attached to it, and passed around the ear of just sufficient tension to counteract the muscular activity of the other side of the face.

Various neuralgias, facial, sciatica, are benefited by the constant galvanic current, the anode placed over the nerve, and the negative at any convenient point, and if there is no yielding to the current alone, comforting results will always follow by the use of ten per cent solution of cocaine by cataphoresis.

Exophthalmic Goitre.—A few years ago it appeared as though the surgical treatment of this neurosis might be the only proper treatment. The pioneers in operative procedure were so hopeful of results, and so enthusiastic in its advocacy, that medical treatment seemed to be malpractice, but with a mortality now on record of over 7 per cent, with a proportion of cures not encouraging, we are justified in continuing those measures that experience has taught us will give a mortality of less than half this percentage, and a very large proportion of cures.

This consists in gradually increased doses of the tincture of strophanthus to control tachycardia, in intestinal antiseptics, including colonic flushing with normal saline solution to diminish auto-intoxication; rest in the recumbent posture for the first few days—absolute, then gradually modified until the patient simply goes to bed early, gets up late, and rests one hour at noon; abundance of easily digestible and assimilable food, and in the early stages of the case the daily use of cerebral galvanization, the large anode over the forehead, the large cathode over the nucha, a current strength of two milliamperes for five minutes; then a large anode over the nucha, and a large cathode applied to the thyroid, with a current strength of five milliamperes for five minutes; then as the third and last step, the cathode should be applied to the epigastrium, and the anode over the length of the spine, for five minutes.

Cataphoresis.—The advantage of cataphoresis in producing local anesthesia for surgical procedures and in relieving localized pains is well set forth in the paper read by Dr. Gill at the last meeting of this association.* But there is another use of this valuable method that I wish to emphasize, and that is the cataphoretic application of the iodides.

A stenographer and typewriter, whom I had treated a few years before for neurasthenia, consulted me about her right hand that had been disabled by being caught in a heavy door a few weeks before. The contusion was a very severe one.

*Journal Advanced Therapeutics, Vol. 22, No. 6, page 347.

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She consulted one of the leading surgeons of the city, and he assured her that no bones were broken, and that there was no dislocation. He ordered her excellent treatment and promised speedy recovery. When she called on me, about six weeks after the accident, the movements of the right wrist and fingers were limited, and she was thereby incapacitated from work. An X-ray examination of the member demonstrated the correctness of the diagnosis, and I told her that the limitation of motion was due to inflammatory exudates, and that they could be removed by iodine cataphoresis. The treatment was commenced, using two sponge electrodes, one on the palmar and the other on the dorsal aspect, about three inches by six inches, to which we applied the liquor iodi compositus, reduced about one-fourth, and a current of five milliamperes, with daily seances, ten minutes duration, reversing the current once at each sitting. The exudates soon began to disappear, and gradually the movements became normal, and these were encouraged by daily massage and passive movement. After the first week the treatments were given every other day. In four weeks she resumed her work.

THREE CASES OF INOPERABLE AND RECURRENT SARCOMA SUCCESSFULLY TREATED BY THE ROENTGEN RAY.*

By George C. Johnston, M. D.
of Pittsburg, Penna.

I wish to present for the consideration of this association, three cases of malignant disease, in which there is no doubt as to the correctness of the diagnosis, and where most careful eradication of the diseased tissue, by skillful and competent surgeons, had resulted merely in temporary relief, the disease again declaring its malignancy by the recurrence *in situ* of the growth; the abandonment and refusal of further surgical measures by the surgeons, and the willing surrender of the case to radio-therapeutic measures, followed by the complete recovery and restoration to health, of each of these patients, and the continued observation of this apparent recovery for a period approaching two years, with monthly examinations of each of the patients and the failure to observe the slightest return of the disease in the original location or any indications of secondary metastatic deposit in any portion of the body. Uninteresting as these case reports usually prove, I feel that they deserve to be presented in some detail.

Case 1. Mr. W. Father of a physician of Pittsburg, Pa. Age, 56; family history, negative; general health, good up to four months ago, when a constant pain demanded his attention. The abdominal muscles, as he expressed it, seemed to be constantly cramping, and a multitude of hard globular masses in the abdominal wall became apparent. He suffered considerable pain and rapidly became cachectic. He fell off in weight, his appetite failed, and an examination of the abdomen, by his son and Dr. Adair, revealed the presence of a very extensive growth, involving the entire right rectus muscle and a large portion of the left. An operation was decided upon, and was performed by Dr. Langfitt, at the St. John's General Hospital, assisted by Dr. Adair and his son, Dr. W. The

*Read at the Fourteenth Annual Meeting of the American Electro-Therapeutic Association at St. Louis, Mo., Sept. 13 to 16, 1904, and published in this Journal by special permission of the author and the Executive Council of the Association.

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operation disclosed such extensive envolvement of the peritoneum and omentum, as to preclude the possibility of a complete extirpation of the growth. Dr. Langfitt satisfied himself by removing the entire right rectus, which was simply a sarcomatous mass of yellowish debris, and a portion of the left rectus, and such other portions of the growth, as seemed permissable. So much of the abdominal muscle was of necessity destroyed and removed, as to necessitate the immediate application of a large abdominal binder which the patient must continue to wear for the remainder of his days. As soon as he was able to leave his bed following the operation, and from which he convalesced rapidly, he was brought to me with the request that I endeavor, if possible, to inhibit the growth of such portions of the tumor as had been permitted to remain at the time of operation. He was very weak, markedly emaciated, anæmic and cachectic and suffering considerable abdominal pain. He was discouraged and disappointed and I did not feel that there was much to offer him. In fact the treatment was only undertaken at the earnest request of his son and Dr. Langfitt.

Treatment was given daily for two months, with a tube of high penetration, at a distance of 18 in., actuated by a 15 in. Queen coil, vibrating interruptor, seven amperes in the primary circuit, duration of treatment 10 minutes. The greatest care was exercised to prevent the occurrence of abdominal burns, which would have terminated the treatment as the patient was in no physical condition to repair such a lesion. The abdomen was tanned slightly and the pubic hair disappeared. During three months the same technic was employed, treatment being given every three days, and during the fourth month treatment was given once or twice a week. At the end of this time treatment was suspended for one month, weekly examinations of the abdomen being carefully made. The pain had disappeared during the two months, the abdominal wall had softened and there was no evidence on palpation of the persistance of any enlarged glands within the abdomen. The patient's color was good, the appetite excellent, general health good. He had gained 30 lbs. and he remains to-day in excellent condition. The most careful and repeated examinations by a number of surgeons having failed to reveal any evidence of any malignant disease.

Case 2. Miss C. Age 42, recurrent sarcoma of the vulva. The patient in 1900 noticed a swelling and tenderness of the pubis, following a blow from the corner of a dining table, swelling rapidly extending downward into the right labia majora. The pain which was constant increased in severity until she was compelled to submit herself to examination at the hands of her family physician, Dr. Frederick, who at once recognized the nature of the trouble and advised immediate operation. The growth was removed as completely as possible by Dr. C. B. King, and an apparent cure was the result. Six months later the growth returned in the scar of the operation, and an examination of the first tumor having shown its malignant nature, a second operation was at once resorted to. This was followed by relief for a period of several months, when the growth returned with all the old symptoms, but this time characterized by great rapidity in enlargement and extension, and whereas the former tumor had to a certain extent been encapsulated and discreet, this recurrence involved the skin, subcutaneous tissue, periosteum and could not be removed surgically without damage to the urethra,

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labia majora and minora and the clitoris. Under these circumstances the surgeons decided that they had nothing further to offer, and suggested that she submit herself to a course of radio-therapy. In view of the undoubted malignancy of this growth both clinically and microscopically, the treatment was undertaken with considerable hesitancy. A Queen self-regulating tube set to back up a spark gap of 3½ in., actuated by the discharge from a 15 in. Queen coil, vibrating interruptor, plain primary, taking five amperes in the primary circuit, was employed. The tube was placed at a distance of 15 in. from the lesion, ten-minute treatments were given daily for three weeks. A lead screen having an opening six inches in diameter, opposite the lesion, was used to protect the abdomen and thighs. At the end of this time the pubic hair had disappeared, never to return. A mild degree of dermatitis was present which caused the patient some slight inconvenience. The pain in the growth had practically disappeared, and it had ceased to enlarge. A rest of ten days was given the patient, and a dusting powder of stearate of zinc ordered, and the dermatitis having subsided and being followed by a dark mahogany tan, treatment every other day, with the same technic was undertaken for six weeks. At the end of this time the abdominal screen was discarded, a fairly high tube with good penetration carrying ½ in. spark on the cathodal side, was employed, and treatments twice a week, at a distance of 15 in., were given for two months. At the end of this time some vague abdominal pains which had given rise to a suspicion of pelvic metastasis having disappeared, the high tube was discarded, and a rest of two weeks given the patient. At this time there remained but two foci of disease, one the size of a lima bean, very hard and slightly movable, one-half inch to the right and one-half inch below the symphysis pubis, the other a thickening of the subcutaneous tissue, in the right labia majora. A Queen tube sharply focussed and rich in chemical ray (a picture tube in fact, which would make a satisfactory elbow in one minute, with eight amperes and a vibrating interruptor), was now employed, placed at a distance of 10 in. from the vulva and a first degree X-ray dermatitis produced. This required six treatments. This dermatitis produced the first complaint from the patient, and she was obliged to spend the most of her time at rest for a period of a week, during which time she suffered considerable pain. This was the last treatment which she received, for following recovery from this burn, every trace of the sarcomatous deposit disappeared and there has never at any time been any indications of a return. Her general health is excellent and she is one of those pleasing assets, a grateful patient.

Case 3. Mrs. R. Referred by Dr. Mercur, with a history of three operations for the removal of a growth involving the entire upper chest, the suprasternal notch, and the left triangle of the neck up as far as the insertion of the sterno-cleido-mastoid. Her voice, from encroachment upon the larynx, was a hoarse whisper. The chin was fixed by a scar tissue, the head could be moved with difficulty from the involvment of the sterno-cleido-mastoid and digastric muscles.

She suffered from paroxysms of dyspnoea and carried the head in the posture and with the care seen in necrosis of the cervical vertebrae. A broad collar of ulceration studded with shallow craters discharging a foul-smelling ropy pus, covered the root of the neck and chest. The edges of this ulceration were abrupt,

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thickened, undermined and equisitely tender. She suffered constant agony and was truly in a pitiable condition. Daily treatment with a tube of low penetration, 15 in. coil, vibrating interruptor, five amperes in the primary, for ten minutes, with the tube at a distance of 8 in. was followed by much relief from pain. Within two weeks the amount of discharge had noticeably lessened and the peculiar odor had disappeared. The pus became thin and sanious, the edges of the ulceration softened and declined and it was necessary to proceed more slowly in order to limit the formation of extensive cicatricial tissue. The ulcerated area at the end of three weeks was left alone, save for the use of a wash of peroxide of hydrogen, and application of an antiseptic dusting powder. The left side of the neck was now attacked daily with a tube of medium penetration strongly excited, and a burn of the first degree produced, with the result that the growth broke down beneath the skin and discharged along the sheath of the muscles at the opening of the suprasternal notch, several ounces of pus finding exit by this route. This was immediately followed by a considerable freedom of motion of the head. At no time was any protective used, save a little foil to cover the eyes and nose. Treatment was now resumed vigorously, over the front of the neck and chest, with the result that the ulcerated area promptly cicatrized with the formation of a medium of scar tissue, and she remains to-day after almost two years, apparently free from any indications of a return of the trouble.

In none of these cases was the slightest difficulty experienced from autointoxication. None of these patients showed at any time any albumenuria. They each seemed to possess a remarkable degree of resistance to the destructive tissue effect of X-ray. They were hard to burn and being burned re-acted promptly. They were able to tolerate large doses of radiation for a considerable length of time. Their skins were active, their kidneys competent. In spite of the nature of the disease and its recurrence they were really favorable patients. In none of these cases was there an expectation of the result finally obtained. There seemed to be no factor which would justify such a hope. They each deserve credit for their own salvation for they rendered faithful attendance, unquestioning obedience, they expected little and demanded nothing, but every effort put forth on their behalf was accepted with gratitude, and met with hearty co-operation. I present these cases because they naturally fall into a class which affords the fullest degree of affirmative evidence of the actual tangible value of the X-ray when properly administered in recurrent, inoperable sarcoma. These cases were undoubtedly sarcoma. The first was a large round-celled sarcoma. This is the diagnosis of the surgeons clinically, and of the pathologists. The second was a small round-celled sarcoma, the third was a fibro-sarcoma. In none of these cases is there the slightest doubt as to the nature of the growth. The surgeons and pathologists are men of recognized ability and their diagnosis is entitled to respect.

Second, these cases were recurrent. The first was necessarily incompletely removed. The second was recurrent after two removals. The third was recurrent after three removals.

Third, each of these cases made a perfect recovery, which recovery is permanent to the extent of two years.

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Fourth, the treatment consisted solely in the application of radiation from an excited Crookes tube, at such intervals and in such quantities as has been demonstrated to constitute it a therapeutic agent. It seems to me, therefore, from the history of these cases (if the evidence heretofore adduced shall be the truth, free from exaggeration, enthusiasm or prejudice), we are justified in believing (and the burden of proof must rest upon the other side), that in this agent, when properly and intelligently applied, we have a curative measure that is entitled to the respectful attention of the medical world, that its development should be encouraged and the technic necessary for its employment perfected, its modus operandi detected and the agent itself employed wherever possible for the relief of human suffering or prolongation of precious life, and the lasting honor of the medical profession.

Editorial.

ARE THE X-RAYS GENERATED BY THE STATIC MACHINE DANGEROUS?

In the London Lancet of Oct. 1, 1904, Dr. W. Salisbury Sharp describes a condensor device, consisting of round brass balls to be placed upon the terminals of X-ray tubes which were to be used upon the Wimshurst static machine, by the use of which the tendency of the current to forsake its path through the vacuum and follow the outside of the tube whereby the X-radiance produced is uneven and unreliable as to its duration and intensity, can be obviated. Condensors for this purpose have been in use in this country for a long time; the Wimshurst machine as a routine working apparatus for the production of therapeutic forces, has long been discarded in this country because of its disadvantageous peculiarities; and the Holtz machine, which has replaced the Wimshurst in this country, never gives rise to the trouble referred to by Dr. Sharp unless the vacuum of the tube is too high, in which case of course a lower vacuum should be substituted. For these reasons, the device described by Dr. Sharp will not be of interest to the readers of this journal but a statement with which he closes his description, namely, that he understands "That dermatitis from X-rays generated by a static machine has not yet been seen," is of interest and moment to every present or prospective X-ray investigator, and we feel that the evil consequences which would result to many if the inference as to safety implied by this assertion were allowed to go without comment, justifies us in calling attention to the matter.

This delusion as to the innocuousness of static machine-generated X-Rays was very prevalent in this country up to four years ago; we ourselves entertained it, and did not discover that it was a delusion until a never-to-be-forgotten demonstration of the fact upon our own person, traces of which we carry to-day, persuaded us that our trust was misplaced. Dr. Louis A. Weigel of Rochester, N Y., one of the best known radiographers in the United States, who strenuously

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believed and taught that the X-rays generated by the static machine would not "burn," has just been obliged to submit to the amputation of one hand and some fingers of the other, after years of suffering and disability, as a result of his misplaced confidence. The case of Dr. John Weldon of Willimantic, Conn., needs only to be mentioned to be recalled by many. He was so severely burnt while skiagraphing his own hip, with rays generated by a static machine that extensive and deep extirpation of the injured tissues was finally resorted to, after he had suffered compiete disability, even to the degree of continuous confinement in bed, and great pain for many months. Many other like cases could be cited as proof of the fallacy of the belief that the X-ray generated by a static machine will not "burn," but we believe the above to be sufficient.

The facts of the case are that X-rays, so generated, are not nearly as active in bringing about a dermatitis as are the rays from the coil-excited apparatus, the former requiring an exposure about one-third longer than the latter for producing this accident, according to the experience of most X-ray workers in this country. That such rays can and will produce burns that are just as bad as those chargeable to the coil-excited apparatus, however, if proper precautions and technique are not observed in their use should be borne in mind, and no more trust placed in the benignant tendencies of the former than of the latter.

THE N-RAYS OF BLONDLOT.

In the first half of 1902 R. Blondlot, professor at the University of Nancy, conducted a series of experiments to determine the speed of the Roentgen Rays. The results of these experiments seemed to indicate to him that the Roentgen or X-Rays have the same speed as light. Further experiments under different and varying conditions led him to put quite a different interpretation on the results first obtained on rays from a Crookes tube.

Blondlot had noticed that when a small electric spark was set parallel to the axis of the tube, the spark increased in brightness when the tube was set in operation, but that this did not occur when the spark was perpendicular to the tube axis. This he interpreted as evidence of polarization of some sort. Again by the use of quartz, sugar, etc., something like rotatory polarization was recognized. A number of quartz plates were tried and then a sugar one which indicated eliptical polarization. But this could not occur without double refraction, which, of course, implied, under proper conditions, simple refraction also. He then showed deviation by a quartz prism and concentration by a lens; also ordinary reflection from polished glass and diffusion from unpolished glass. All this was strong indication that the rays concerned were not X-Rays at all, but a new sort of radiation having, besides the attributes referred to, the power of passing through aluminum, wood and some other optically opaque substances, but producing no flourescence or photographic action. These rays Blondlot called the N-Rays.

In accordance with his first experiments these rays and not X-Rays were found to have the same speed as light.

On pursuing his studies further it was found that all sources of light of

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very small intensity could be used to demonstrate the existence of N-Rays. He used small gas flames, red hot platinum wires, phosphorescent screens, etc., and found them all to be increased in brightness by the action of N-Rays. Furthermore, a Crookes tube was by no means the only source of these rays; the electric arc, a Nernst lamp, and Welsbach mantle, and especially the sun, emitted them.

Reflection and refraction of N-Rays Blondlot found to be the subject to the same laws as light. He used lenses and prisms of aluminum, and found that the indices of refraction came between the values 1.04 and 1.85, thus showing considerable variation of wave length, viz., 0.0081μ for index 1.04 and 0.0176μ for index 1.85. These wave lengths were measured both by the grating method and by a method based on the use of Newton's rings, and the values obtained were found to agree closely.

The conclusion is, then, that N-Rays are the same kind of energy as light, the wave length, however, being much less. They should then have the same speed of propagation as light, since according to the electro-magnetic theory of radiation, the speed is the same for all wave lengths. But this is in accord with the first results obtained by Blondlot when he thought he was working with the X-Rays. He says: "Cette verification d'un fair pour anisi dire assure d'avance n'est pas, a mon seus, sans interet; elle confirme la cohérence compléte de ce que nous savons des rayons N." The preceding is an abstract of an up-to-date resume of the subject by Blondlot himself published in May last in "Archives des Sciences Physique et Naturelles," Geneva. It must be added, however, that few if any experimenters outside of France have been able yet to convince themselves even of the existence of the so-called N-Rays. Even with the use of an "N radiometer" imported for the purpose the writer has been quite unable to get any results whatever. Others also seem to share our feeling of distrust, though in some cases the reasons given may not meet our approval. In a recent number of the "Archives of the Roentgen Ray" (August, 1904), one of the reasons given in an editorial for not noticing the change in brightness of the little screens is that if the image fell on the "Blind spot in the retina of the eye (fovea centralis) it fails to influence the brain and is not recognized". As the fovea centralis is the seat of *most distinct* vision this reason for the non-existence of the N-Rays loses some of its force. Seriously, though, it is difficult to understand why other physicists have not been more successful in their efforts to repeat even some of the most simple of Blondlot's experiments.

Miscellaneous Abstracts

ELECTRICITY IN MEDICINE.

A. D. Rockwell, M. D., Medical Record, October 1, 1904.

In his presidential address to the fourteenth annual meeting of the American Electro-Therapeutic Association, held at St. Louis last month, Dr. Rockwell calls attention to the widely different conditions that confronted those who did the pioneer work of electro-therapeutics. Then there existed but the rudest construc-

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tions for practical work and no instruments of precision. Now we have at our command innumerable gradations and manifestations of electric force, and while yet we know not what electricity is we so understand the laws which govern it that it becomes obedient to our will in innumerable ways. In many ways empiricism still attends its use, and it is still the home of much of ignorance and credulity. The world has not yet aroused to its vast possibilities in medicine.

He declares the Association to be unique, in that it confines itself solely to the discussion of electricity as a remedial agent. In this he sees an element of strength through the concentration of energy upon a single object, and of weakness in the danger of forgetting that one is a physician first, and an electro-therapeutist after. The history of therapeutics is a history of blasted hopes; but few new therapeutic agents accomplish what is claimed for them. He deplores the tendency in the rush for precedence to cast aside conservatism, and instead of waiting until experience has shown the advantage and limitation of the new agent, to rush in to print with statements of therapeutic results that will not bear the test of scrutiny. Honesty of purpose and absolute integrity in clinical reports is the only shield of defence for the electro-therapeutist. Simple honesty of purpose combined with education and observation he declares is capable of lifting this department of medicine to a higher plane. Electro-Therapeutics is an unexplored ground to a majority of physicians. He urges the members of the association not to restrain their enthusiasm, but to see that the judicial faculty be not subordinated. He says, "be true if you would be believed, understate rather than overstate." Attention is directed to the practical abandonment of the so-called galvanic and faradic currents in favor of the newer forms of static and high frequency. These newer forms of electricity do not constitute the whole of electro-therapeutics, and one must differentiate, not confining his efforts to any one modality, because of ease of administration. He pleads for conservatism in electro-therapeutics and in the exploration of new fields, and calls attention to the commercial spirit with its tendency to over-master the spirit of truth, and prophesies the degradation of electro-therapeutics if this broad commercialism be allowed to spread its blight.

ELECTRO-THERAPY.

HIGH FREQUENCY CURRENTS; THEIR PHYSIOLOGICAL ACTION AND METHODS OF APPLICATION.

A. D. Mabie. Medical News, New York, Sept. 3, 1904.

After a review of the physics of high frequency currents, Mabie discusses the physiological properties of these currents in relation to the nervous system, circulation, respiration and urinary secretion. They exercise no action upon general sensibility or muscular contraction, there being a slight heat sensation alone at point of application, and this absence of sensation and contraction is due to the extreme frequency of oscillation, the rate being beyond the limit at which the nerves are capable of response.

Upon the circulation the effect is that of a vaso-dilator, the skin becoming covered with sweat. When the spark from a resonator is directed upon the skin a profuse redness results, followed after a half hour by an energetic vaso-constric-

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tion. The number and amplitude of the movements of respiration, the volume of oxygen absorbed and of carbonic acid emitted increases considerably. Direct application of these currents regulates diuresis, increasing elimination of extractives, notably urea, and also increasing the toxins. Berlioz noticed with condensation that the nutritive processes appeared more active, that urea, uric acid, phosphoric acid and chlorides were notably increased.

In direct applications the patient is connected to the two poles of the solenoid by conducting cords attached to metal plates covered with moistened felt and applied to skin. These electrodes must be closely applied or burning will result. In local applications the familiar ball or point electrode is used and the other pole is attached to patient, grounded or left free. The patient experiences a slight sensation of heat at the point of application and in some cases an analgesic action. Lassitude sometimes follows the seance.

Different forms of electrodes are employed. The metallic brush in chronic affections without inflammation. A metal point for effluvation of a limited area. A glass electrode for the treatment of sensitive surfaces as the face or mucosae.

The writer prefers one provided with a wire extending within one-half inch of the distal end and exhausted to a Hittorf vacuum.

The physician must in each case proceed with caution. Watch with care the first seances of the treatment and the reaction of the patient will quickly inform as to the advisability of diminution or increase of intensity. In general prolong the application ten minutes and administer three times a week. The conditions must vary with the nature of the disease and the toleration of the patient.

In auto-conduction the subject is placed in an oscillating magnetic field of a large solenoid. In the beginning of the seance some patients complain of headache, vertigo, nausea, etc. After a few hours this reaction may be followed by fatigue and extreme lassitude. It would appear that precautions are necessary in the application of this modality and it is well to begin with short seances. It is not possible in so short an article to furnish a formula of the indications of high frequency currents, because of the diversity of their methods of use and the extent of their field of application.

In conclusion, however, they have been employed and have given excellent results in diseases due to lowered nutrition, affections of the respiratory tract, constipation, hemorrhoids, anal fissure, neurasthenia and neuritis, articular affections of different origin and a variety of dermatosis. The only contra-indications for high frequency currents are valvular disease of the heart and hysteria.

RADIO-DIAGNOSIS.

TWO CASES OF RENAL CALCULUS IN WHICH THE X-RAYS FAILED TO INDICATE THE PRESENCE OF A STONE.

R. Clement Lucas,—British Medical Journal, October 1, 1904.

These cases are reported by Dr. Lucas as evidence that the X-ray cannot be depended upon as a diagnostic agent in renal calculus. One was a small stone found upon operation in the kidney of a stout woman; the other was a large stone

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found in the kidney of a thin spare man. In both cases the X-ray findings did not indicate that any calculus was present.

As everything depends upon the technique when the X-ray is employed for this purpose, and as Dr. Lucas gives no particulars as to the technique used in these cases and does not mention the name of the operator, there is no way of judging of the efficiency with which the rays were applied, and the report is therefore useless as evidence regarding the value of the X-ray. Very few operators are capable of producing satisfactory and reliable results with renal calculi, and it would be very easy to collect any number of cases in which renal calculi were present and not shown by the radiograph of the ordinary operator, without in the least invalidating the claims of the X-ray to respect as a reliable diagnostic agent in this condition.

RADIO-THERAPY.

X-RAYS IN TREATMENT OF PULMONARY TUBERCULOCIS.

Emil H. Grubbe, Alkaloidal Clinic, October, 1904.

Pulmonary tuberculosis is dependent primarily upon a peculiar kind of mal-nutrition by reason of which the power of resistance of the lung tissues is markedly diminished which enables the tubercle bacilli to effect a lodgment and next a development of colonies. In some cases this mal-nutrition may be due to inadequate food supply, but in the larger number it is defective chemical elaboration and absorption of food. Grubbe considers that the X-ray is a logical therapeutical agent, and that its now-demonstrated power in removing tuberculosis of the skin and bones justifies investigation as regards its effect upon the pulmonary forms. He considers that the X-ray may be applied with benefit in all forms or stages of the disease, but that it is of particular advantage before the case has progressed to cavitation; the treatment is more effective when it is begun early and before complications are present. Pulmonary tuberculosis can be diagnosticated earlier by the X-ray than by any other means, and long before physical signs are grave enough to attract attention.

He recommends daily sittings, lasting from twelve to twenty minutes when the tube is excited by the static machine, or from eight to fifteen minutes with the coil-excited apparatus, and that half of the exposure be made upon the patient's chest and the other half upon his back. If the patient complains of weakness or faintness, the exposures are too long. The tube should back up a spark-gap of from three to five inches, and should be provided with a universal vacuum regulating device; the glass of the tube should be placed about six inches from the body, and the tube should not be excited to give a bright luminosity, only a subdued light.

He does not use a mask or other protection, except on the face and hairy parts of the body. Generally sustaining treatment is also indicated. An excessive use of fat is emphatically opposed, as fat hinders metabolism, thereby exerting an influence which favors the accumulation of morbid products in the system.

Ozone generated from the top of an Oudin resonator administered for from

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five to twenty minutes each day, is regarded as very effective in preventing or lessening the danger of infection from pus-forming organisms. The X-ray probably produces its beneficial effects in this disease through its power of stimulating cell activity and possibly of producing physiological congestion of the lungs, whereby nature is given an opportunity to wall off the infected areas, by the formation of fibrous tissue. This local stimulation also increases the ability of the blood vessels to absorb and remove morbid products. Frequent blood examinations show rapid increase in the number of red cells and the percentage of haemaglobin. Increase in bodily weight and strength is also noticed, and pain, cough, expectoration, and night-sweats are lessened from the beginning.

Fifty-four cases are reported. Twenty were discharged symptomatically cured, sixteen were improved, twelve discontinued treatment, and six died while taking treatment. The average length of time under treatment of the cured cases, was eight months. Even in very advanced cases, marked benefit was observable.

Dr. Grubbe emphasizes the necessity of pushing the X-ray treatment of pulmonary tuberculosis when it is once begun.

A CANCROID ENGRAFTED UPON A LUPOUS BASE IN A DIABETIC, TREATED WITH ROENTGEN RAYS.

Max Levy Dorn—Berl. Klin. Woch. IX. 1904.

The affection began twenty-eight years ago with a small brown spot upon the nates which slowly grew larger. When placed under treatment there was an abcess 6 cm. long and 5 cm. wide, which excreted fetid pus. The diagnosis was lupus and cancroid, the latter having developed upon the former. The trouble was complicated by a severe diabetes mellitus. The subjective symptoms of the ulceration were mainly pain, inability to sit or to lie down and lack of sleep. Roentgen radiation was commenced Nov. 3, 1903, ten minutes every other day, after the second treatment secretion and pains became less and after the third treatment the formation of skin over the ulcer was noticed. After ten radiations the ulcer was entirely covered with new healthy skin except three small spots, which necessitated twenty-three more radiations during the months following.

(The author does not mention the technique, which deprives this communication of much of its value.)

THE RADIOTHERAPY OF TUMORS OF THE UTERUS.

R. Kothe—Deutsche Med. Woch. IX. 13.04.

The author has written this article as a contribution to the radiotherapy of deep-seated tumors. He relates four cases of myoma uteri and one case of myoma with a cystoma ovarii, and in each case a reduction of the myoma was noticed but no change in the ovarian tumor. As the author does not say a word about the technique, whether through the abdominal walls, or through the vagina, etc., his communication is of relatively little value.

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ON THE INFLUENCE OF PHOTODYNAMIC SUBSTANCES UPON THE EFFECT OF ROENTGEN RAYS.

R. Kothe—Deutsche Med. Woch. IX. 15.04.

Experiments made by the author shows that the susceptibility of the photographic plate (bromide of silver) for Roentgen rays can be changed by colored solutions. One-half of each plate was put into a colored solution and after having dried, a radiograph of the hand was made upon it. In all plates which were treated with blue-green, blue, and violet colors, the colored half after being developed remained much lighter and showed only an indistinct, pale picture of the bones. In plates treated with yellow, orange, or red colors, no difference could be noticed. Therapeutically eosine solution 1 :100 and 1 :1000, was, about an hour before the irradiation, injected under the skin. On account of lack of malignant skin tumors, warts were treated and with a positive result, i. e., the reaction appeared quicker and with more intensity than in normal non-prepared tissues. In a case of lupus faciei two radiations and one injection caused, after a few days, a severe dermatitis.

Control experiments with animals—eosine injection on one side of the back and daily radiations right over the middle line—also show that the effect of the Roentgen rays are considerably increased by injections of eosine solutions.

A CLINICAL COMMUNICATION ON LIGHT TREATMENT AFTER SENSITIZATION.

(From Finsen's Light Institute in Kopenhagen.)
Dr. Forchhammer—Deutsche Med. Woch. IX. 15, 04.

The author gives a historical resume of the attempts which have been made to utilize therapeutically the different light rays, and of the experiments and clinical results of the more penetrating yellow and yellow-green rays after the tissues have been "sensitized" with erythrosine solution (0, 5-1% in physiologic salt solution). The therapeutic results, no matter how the details in technique were changed, were always negative; with a strong radiation necrosis was noticed several times so that the author warns against the employment of this method. The cases on which the method in Kopenhagen was tried, were all cases of lupus vulgaris.

THE FINSEN LIGHT TREATMENT.

Rollin H. Stevens—N. Y. Med. Jour. & Phil. Med. Jour., August 20 1904.

Stevens believes that a large proportion of the failures to secure satisfactory results with the various arc light lamps, other than Finsen's, are due to the fact that to the ultraviolet ray has commonly been accredited the curative power of the Finsen light. It is now beginning to be appreciated, however, that the blue and violet rays are important elements in the production of the therapeutical influence of the Finsen light and the various lamps that have been evolved with the idea of doing the work of the Finsen light at a lower initial cost are deficient in the production of the blue and violet rays. "Blue and violet rays can penetrate deeply into the skin, but only when it has been made bloodless; and the ultraviolet rays can, under no circumstances, penetrate deeper than the superficial layer of the skin, but they give rise to dilatation of the blood vessels."

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"Jansen found that the rays from the soft iron, water cooled electrodes, such as characterized the Bang type of lamp, were very rich in ultraviolet rays with wave length of about 322 micromillimeters; that they were strongly inflammatory; also, strongly absorbable, so that a thin layer of agar or gelatine protected the bacteria in perceptible degree from the action of these rays. When a plate culture of Bacillus prodigiosus in agar was exposed to the rays of such a lamp, he found that the time necessary to kill the bacteria increased sixty-four times; while, with the intervention of a thin layer, ½ mm. thick, between such light and the bacteria, there was very slight action on the germs after an hour's exposure. Substituting the Finsen apparatus for the iron lamp, other conditions being the same, the bacteria were killed after nine to ten minutes' exposure. The iron electrode lamp required from two to five minutes to blacken chloride of silver paper placed behind the dehaematized ear of a rabbit; but the Finsen apparatus required less than a second." Thus is demonstrated the much greater penetrating power of the real Finsen light. The iron electrodes give a radiance richer in ultraviolet light than the carbon arc but not so rich in blue and violet rays.

Burns from the Finsen treatment are unnecessary and invariably due to the carelessness of the operator or patient. They always give the pain of the burn at the time which comes on gradually so that the patient has time to inform the operator who will find that the cone of light from the lamp does not fall simultaneously on all parts being treated. This can easily be corrected. The time durations of treatments varies from fifteen minutes to an hour and a quarter. "Red birthmarks require but fifteen minutes to twenty minutes, as do also alopecia areata and some eczemas where there is not much infiltration. Most cases of chronic eczemas, however, are cured in one or two half-hour exposures. Psoriasis and lichen planus usually require one hour of treatment, as do also lupus vulgaris and epithelioma, though the two latter sometimes need a quarter of an hour extra. In some cases of lupus erythematosus the treatment has been given by the author for but half an hour, though usually one hour is given by Finsen. Some of the cases treated for just half an hour seemed to do better than those treated a full hour, the longer treatment apparently aggravating the condition." In some cases of eczema of the hand where the eczematous parts were soaked in erythrosine solution for ten or twelve hours previous to the treatment, twenty minutes' exposure gave very satisfactory results; eczema patches of twenty years' standing disappearing after two such treatments. This is confirming the inductions of Neisser and Halberstaedter as to the effect which sensitizing bacteria will have in facilitating the cure of the trouble but this method when it has been necessary to inject the erythrosine solution subcutaneously has not, in Stevens' experience, produced any beneficial results.

Stevens considers that the Finsen light is better than the X-Ray for the treatment of lupus, but that epithelioma, chronic eczema, and deeply seated pathological processes seem to respond better to the X-Ray, as the penetration of the Finsen light is not great enough to influence lesions below the surface. He reports some excellent results in wine colored birthmarks, xanthoma and acne rosacea. He considers that the Finsen treatment has no superior as an effective and speedily curative agent in these conditions to which it is applicable.

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MY EXPERIENCE WITH LIGHT THERAPY.

Julius Rosenberg.—Medical Record, N. Y., Oct. 22, 1904.

Rosenberg reports twenty-seven cases treated with ultra violet light. He claims that he has found these rays to be almost a specific against pain. He notes the disappearance of the gonococci in a case of gonorrhoea. After six treatments of one hour each, in a case of supposed locomotor ataxia, treatment was followed by relief of pain, which had failed to yield to the various coal tar products.

In a case of leucorrhoea, which had been curetted without benefit, and which showed an enlarged sensitive uterus, and an enlarged and painful left tube and ovary, application of light to the abdomen was followed by rapid improvement. After this treatment the uterus was smaller and less sensitive, and the case was cured in six weeks. He considers the violet rays a specific remedy in catarrhal inflammation of the female genitals. Cases of lumbago and sciatica experience relief from the pain and discomfort, following a single exposure to the light. A case of sciatica, of five months' duration, which had been treated by various means, received thirty-three treatments, with complete restoration to health as a result.

In Case 12 he details an acute sciatica cured in one treatment of one hour's duration. This case he claims is an illustration of similar cases, relief being almost instantaneous in acute neuralgias and muscular pain.

In chest affections the relief of cough, expectoration, and sweating, is almost immediate and seems to be the usual consequence of the doctor's methods of application. Two cases of acne, and one of furunculosis were promptly cured. These cases were treated by means of a 35-ampere arc lamp, with mirror reflectors. The terminals were of iron and carbon. The author believes that the laboratory experiments which show that the penetration of ultra violet rays is slight, are erroneous, basing his conclusions upon the result achieved by the application of the rays for the relief of deep-seated lesions of the nerve trunks. He concludes that the ultra-violet ray obtained from an arc of high amperage are a specific remedy in acute muscular pain, that they will always relieve the pain of neuritis and often effect recovery. The results in chronic neuritis are encouraging, and in acute and chronic pleurisy and bronchitis undoubted benefits are derived. He also sees reason to hope for benefits in the treatment of pulmonary tuberculosis, in gonorrheal peritonitis, inflammation of the deep-seated urethra, and in tuberculosis infections of the joints. The description of the apparatus employed by Dr. Rosenberg is inadequate, and the statement of results obtained is so remarkable as to challenge the credulity of anyone whose experience with this agent has not been so uniformly successful, more especially in view of the fact that the greatest difficulty is experienced even with the most powerful apparatus in securing sufficient penetration to cure tubercular nodules in the skin, in an ordinary case of lupus. It is difficult, therefore, to see how one is to affect the uterus by an application of light upon the surface of the abdominal wall.

In the light of such reports as the above this subject must be investigated. If other investigators are able to reproduce this result in similar cases the ultra-violet ray will in the future occupy a much more prominent place in the armamentarium of the physician than it does at present.

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A FEW NOTES ON RADIUM.

Morton Smart.—Medical Electrology and Radiology.—September, 1904.

Of all the long series of marvelous phenomena which have been discovered in connection with radium, the spontaneous transformation of its emanation into helium probably through a process of decay is the most remarkable, because it is a demonstration of one substance changing into another. The atomic weight of helium is only 2. If other elements are going through a similar series of changes, that is to say, if all bodies of high atomic weight are breaking up into other bodies of low atomic weight, the thought that naturally arises is that could a means of reversing the process be discovered the transmutation of metals would be an accomplished fact.

Besides all these wonderful chemical and physical properties, radium also possesses very powerful physiological properties, which, if not borne in mind, may do serious damage. Most people already know that radium is an exceedingly dangerous substance to carry about if unprotected, as there have been several cases recorded where severe burning of the skin has resulted in this way.

Experiments have been carried out with a view to determine the effect of radium rays on different forms of bacteria, but the results have not so far proved very encouraging, although certain micro-organisms are destroyed by long exposures.

The public has displayed a feverish interest in radium, mainly due to the hope, stimulated by irresponsible newspapers, that at last the means of curing cancer has been discovered. It is still much too early to make any definite statement on this important point as reliable information is so difficult to obtain; and also because the experimental stage must of necessity be a long one. At the same time it has been by no means proved that radium has done more for such cases than the X-ray treatment would have done.

ON THE EFFECT OF RADIUM EMANATIONS UPON MALIGNANT TUMORS

A. Braunstein—Therapie der Gegenwart. Sept. 1904.

Chloride of radium was dissolved in water, connected with a distillation apparatus and heated. The distilled liquid, having thus become radio-active, was brought into a closed glass vessel, and was used under the name of aqua radiata for treatment and for injections into tumors.

In cases where an injection was not possible, subnitrate of bismuth was employed which had been made radioactive in the following manner. Bromide of radium either in substance or in solution was brought into a well-closed glass vessel and the bismuth was kept in the same vessel for from three to five days. The radioactive powder, called bismuth subnitrate, is diluted with some water and is either given internally (carcinoma of esophagus) or painted with a hair brush over the diseased area.

The author comes to the following conclusions:

"1. The radium emanation as employed by me does not injure the normal tissues and causes no ulcerations as will the radiation from radium.

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"2. The application of the emanation is easy to tumors which are not accessible to the radiation.

"3. As radium after evaporation or distillation regains its property of emanation, the same piece of radium can be used indefinitely.

"4. By giving radioactive bismuth per os in carcinoma of the esophagus the tumors can be gradually removed, as the bismuth in passing the narrow passage in the esphogaus will remain on the tumors and exercise its radioactive effect.

"5. By injecting radioactive water (aqua) it is possible to cause the sterile disintegration of a malignant neoplasm without injuring the skin or the healthy tissues or without causing an ulceration on the surface of the tumor."

Current Electrology and Radiology

(Only articles relating to the above named subjects will be abstracted.)

JOURNAL OF ADVANCED THERAPEUTICS.

New York, N. Y., October, 1904.

1. **Electricity in Medicine—A. D. Rockwell.**
2. **The Cataphoric Treatment of Cancer—Amedee Granger.**
3. **A case of Fibromyxosarcoma of the Sacrum of large size, successfully treated by cataphoric operations with preservation of sphincter—G. Betton Massey.**
4. **Radiography—Herman Grad.**

1. See under Miscellaneous Abstracts, page 411, this journal.

2. See page 343, September issue of this journal, abstract of another paper on the same subject by the same author. Twelve most interesting cases are reported in full with cuts.

3. See abstract, page 373, October issue of this journal.

4. This article is continued from the September issue and consists of the advanced sheets of the chapter on Radiography and Radiotherapy, which is to appear in "Conservative Gynecology," by Dr. G. Betton Massey, now in process of publication.

The author gives an excellent but short description of the nature of the X-ray, then of the approved methods used in fluoroscopy and skiagraphy, with the technique, time of exposure, and exact methods of localizing foreign bodies. Apparently the subject is to be continued in future issues.

ARCHIVES OF THE ROENTGEN RAY.

London, England, October, 1904.

1. **A Contribution to High-Frequency Technique—Henry G. Piffard.**
2. **A Torch for Lowering Crookes Tubes—Milton Franklin.**
3. **High-Frequency Currents: Some Infective Diseases Amenable to Treatment—(Continued from page 82) —Clarence A. Wright.**

1. Piffard defines the D'Arsonval Technique as comprising several currents, all being developed, however, by a disruptive discharge of a high tension electrical current through a condenser, and the passage of this current through a

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solenoid. The inner armatures of the condensers, of which the flat form is mostly employed in France, and the Leyden jars elsewhere, are connected with the poles of the exciting apparatus and the outer armatures with the solenoid. The patient is connected in shunt with the solenoid, the impedance generated in which causes a portion of the current from the external armatures to pass through the patient. A high-frequency apparatus may be excited by either coil or static machine.

Piffard has found that a spiral substituted for the solenoid produces a more efficient current, and has evolved a high-frequency apparatus in which the spiral takes the place of the solenoid; he has also modified the D'Arsonval cage for the production of the auto-conduction current by giving it a spiral roof. When in use the center of this spiral roof and its outermost turn are connected respectively with the outer armatures of the condensers. Careful experiments have satisfied Piffard that this arrangement is more efficient than the ordinary cage without the spiral roof.

For the auto-condensation couch, the author has evolved a substitute which takes up less room, and does not render it necessary for the patient to lie down. He selects a comfortable arm chair, and fastens a brass ball two inches in diameter upon each arm. These balls are connected together by a wire, running around under the chair. He then places upon the seat of the chair, a cushion constructed as follows: "A circle seventeen inches in diameter is cut out of white-wood one-half inch in thickness. Commencing at the center, a spiral of No. 3 (B. and S. gauge) aluminum wire is wound with turns two inches apart between centers, until the circumference of the wood is reached, when the wire is turned to form a small loop. The wire is firmly attached to the wood by a sufficient number of double-pointed tacks. Three other circles are cut from the same wood, one-quarter inch in thickness, and glued together to prevent warping. This three-ply piece is then fastened to the other by dowels, with the wire between them. A circle of plumber's felt, an inch or so in thickness, is then placed on the thicker circle, and the whole covered with genuine or imitation leather." When in use, the outer armature of one of the jars is connected with the loop in the cushion spiral, and the outer armature of the other to one of the balls on the chair or the wire connecting them. With a twelve-inch coil and a Wehnelt interrupter adjusted to give six amperes through the primary, he finds that the current through the patient with the above apparatus measures from 450 to 500 amperes (milliamperes is probably meant) as measured with a hot wire galvanometer. If the static machine is used, grounding the condenser on the negative side will produce a stronger current, usually from 225 to 250 milliamperes. The effect can be still further intensified by having the operator connect himself with a second ground.

The "Hyperstatic transformer," another of Dr. Piffard's inventions, consists of a primary coil of coarse wire wound as a solenoid around a heavy glass tube, inside of which is an open wire secondary, with its terminals projecting from the ends. The terminals of the primary are connected with the external armatures of the condensers, the internal armatures being connected with the pole-pieces of the static machine, which is usually operated with a spark-gap of about two inches. When the instrument is constructed with the capacities in proper relationship to the initial current, the effluve and sparks from one of the terminals of the second-

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ary, the other terminal being grounded, resemble in character those obtained from a resonator, and may be applied to the same uses.

2. "This torch consists of a glass tube about one-half inch in diameter and eighteen inches in length. The interior is furnished with a partition at six inches from one end, marking the limit of the alcohol chamber. At about three inches from the partition the tube is bent at right angles, and at the end of the short arm thus formed is placed a brass nipple with wick, as in ordinary alcohol torches. The portion of the tube behind the partition is simply closed, and serves as a handle.

"The advantage of this torch is that on account of its length and non-conducting properties it may be used to lower the tube while running, with no risk of shock to the operator or any of the disadvantages of stopping the machine and again starting. The latter is a valuable consideration, in view of the absolute accuracy with which the vacuum may be regulated, with none of the uncertainties attending the older method, where the tube was allowed to cool, and the amount that the vacuum had been altered was known only after trial."

3. Four more cases which were treated by Dr. Oudin are reported with the same remarkable results noted in those which were described in the previous installment of this article, abstract of which will be found on page 390 of the October number of this journal. One of these four cases was cured apparently, one was practically cured, one was very greatly improved, and in the fourth, in which the pulmonary trouble was complicated by a very severe and extensive lupus of the face, the lupus was entirely cured and the pulmonary tuberculosis very greatly improved in the course of four months. Disappearance of tubercle bacilli from the sputum, great lessening and sometimes entire disappearance of the cough, and very marked gain in bodily weight have been almost constantly present in this whole series of cases which constitutes a remarkable commentary upon the efficacy of the high-frequency currents in pulmonary tuberculosis.

Of tubercular lesions of the digestive track, only those situated at the two terminal apertures have so far been treated. Tuberculous ulcers of the mouth and fauces are seldom amenable to treatment by scraping, and even when they heal under curettage are very apt to recur. Patients usually die inside of two years. The high-frequency current has proved its superiority to the knife in these cases.

The electrodes employed are usually of the condenser type, except in the case of fistulæ, wherein the flexible single wire electrode has been employed. Treatments vary from five to ten minutes, and are applied from two to four times a week. In some cases, the beneficial effects are observed as early as the third or fourth seance; in others, a dozen or more applications may be necessary before such benefits appear. The pain is usually diminished, but the patient sometimes feels an increase of warmth about the parts. A case of pulmonary tuberculosis complicated by tubercular ulcer, and enlargement of sub-maxillary and sub-mental glands reported by Reus, is described in full. The ulcer was entirely healed, the patient's general health was brought to the normal point, and tubercle bacilli which had at first been numerous in the sputum, entirely disappeared; although some residual dullness remained at the apex of the lung, yet as all the other signs of tuberculosis had disappeared, the patient may be pronounced cured.

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Another case of tubercular ulcer upon the roof of the mouth areas of dullness being scattered over the lungs, was treated by five minutes of effluvation (intensity of current one hundred forty milliamperes); cocaine was painted over the surface to make the application endurable. Treatments were given about three times a week and in about five months, the cure was complete in every respect. This patient had been treated for months previously, by cod liver oil, alkalies, iodide of potassium, and sarsaparilla, without beneficial effects.

Another case reported by Crooneg, of tubercular stricture of the rectum, complicating pulmonary tuberculosis, was treated with a conical electrode, every second day for from six to ten months in which time "the pain in the part rapidly diminished; the stools became less frequent; the stricture slowly yielded to treatment. As the size of the rectal electrode was progressively increased, it was noticed that the scybalæ gave place to more formal motions, which gradually increased in size. By the end of the eighteenth session, the rectum was fully dilated, and the ulceration above completely healed. The fistulous openings which were treated by the passage of the single-wire flexible electrode, either alone or combined with scraping, were healed about the same time. The patient has since visited me, and I have on each occasion been able without difficulty to pass the largest-sized rectal bougie, proving that the cure obtained was permanent."

ARCHIVES D'ELECTRICITE MEDICALE.

Bordeaux, France, September 10th, 1904.

1. **Electrolytic Treatment of Pterygium—Dr. P. Pansier.**
2. **Two Cases of Tuberculous Lupus Treated with Radiotherapy—L. Auge.**
3. **An Improvement of which the Wimshurst Machine is Susceptible—Dr. Stephane Leduc.**
4. **A Few Cases of Cancer and Tuberculosis Treated by the Roentgen Rays—Dr. J. Reboul.**

1. Stankey of Chicago was really the first to use electricity in the treatment of pterygium. He used a fine platinum needle in connection with the positive pole introducing it into the conjunctiva near the summit of the tumor in a verticle direction. He limits this treatment to cases where tumors do not cover much of the cornea. Pansier follows this method except that he uses the negative pole instead of the positive, the latter being applied to the temple. The current is gradually applied after the part has been locally anaethetised, as he thinks the operation is painful, contrary to Stankey, who claimed it was not painful. The length and intensity of the application vary according to the size of the pterygium. In small tumors thirty to ninety seconds with a current of three to four m/a is sufficient, while in large ones it requires two or three minutes with a current of ten m/a. In small tumors results are positive and definite, more rapid when needle is passed horizontally. After applications there follows a swelling of the conjunctiva and eye-lid, tumor seems thicker and more voluminous. This lasts about forty-eight hours. In voluminous tumors there results a hard cicatrix which prevents movements to the internal side and which must be operated on. In recurring ptergium the results are similar to those of voluminous tumors. Author advises use of this method in small tumors, but not in voluminous or recurring ones.

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2. Auge used the following method in both cases: a Gaiffe coil giving a spark of forty cm. controlled by a Contremonlin-Gaiffe interrupter. The current, taken from city wires had a voltage of 125. The tube was a Chabaud with an osmo-regulator mounted in series with a Vaillard valve. The spinter-meter of Dr. Beclerc was placed next to the valve, thus allowing a spark equal to that of tube. This was regulated to give spark of six cm., the rays corresponding to Nos. 5 and 6 on Benoist radiochronometer. The tube was held 15 to 20 cm. from the skin.

First case was of lupus covering most of the face and neck, and exhibiting blotches on body. The disease was nine years old and patient twenty. Several treatments had been tried with varying success. Disease gradually spread to its present state. The nose is eaten to the cartilage, while the pinna of the left ear is entirely destroyed. A deep ulcer is found back of the angle of the jaw. A lead helmet with openings for diseased parts was used to protect healthy tissues. Applications three times a week, five minutes on left side and five minutes on right at each sitting. Ten applications given between December 12 and January 2, then treatment interrupted till January 25, then resumed until February 22. At this date cure seemed assured. From February 22 to March 9, high-frequency applications with electrode having glass covering of Dr. Bisserie were made, then radiotherapy continued with applications of three minutes' duration till March 21. High frequency was used again till April 2. No treatment during April. On May 5 lesions of the face and neck had cicatrized except a small place in the center of the left cheek. Treatment of other parts of the body then begun, and the cure is not yet finished, but good results seem certain.

Second case; a girl sixteen years old whose disease dates from the age of three. Lesions of lupus about four cm. in diameter on center of right cheek. Treatment begun March 12. Same application as in case one. On June 25 there is almost complete cure, there remaining but two small yellow dots on the cicatricial tissue that had formed all over the lesion. The results obtained indicate that radiotherapy is very effective as a treatment for lupus, being used more advantageously than phototherapy.

3. From the theory of the machine there results that the current delivery is proportional to the capacity of the condenser formed by its two plates, that is, it varies inversely as the distance which separates their external surfaces and is proportional to their dielectric coefficient. Progress ought to be made in the line of increasing ten to twenty times the delivery by using mica dielectrics and bringing the sectors to a minimum distance. The solution of the problem ought to be facilitated by the following suggestions: Up till now we have compounded all the elements of the machine into a whole; they should be separated, in one part the condenser, made of mica perhaps and plates whose thickness is sufficient to exhibit a resistance which will permit them to be rotated at high speed; the metallic sectors no longer placed on external surfaces but on internal aspects of plates and recovered by thin sheets of mica. Metallic pins going through the plate and ending on external surface in a button would connect the brushes with the armature of the internal surface of the plate supports, these armatures being separated only by two thin sheets of mica and the air space reduced to a minimum. The plates

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could be turned at high speed and the machine thus realized ought to give results, making it a truly new generator.

4. The author reports on eight cases in all, six of cancer and two of tuberculosis. In all cases the following technique was employed: Healthy surroundings protected by sheets of lead; coil giving spark of 50 cm. with rapid interruption and producing a skeinlike spark; Chabaud tubes with Vaillard osmoregulators. Each application lasted from one to five minutes, with rays of a mean penetration of six by Benoist's radiochromometer. Following the exposure of the lesions to the rays, the following successive phenomena were observed:

1. Lessening and more often rapid and complete disappearance of pain and itching.
2. Suppression of the odor of ulcerated cancers.
3. Cessation of haemorrhages.
4. Increase in secretions, then dessication of ulcers.
5. Decrease in volume and surface area of tumors.
6. Production of cicatrix, white, pliable and regular.

The eight cases cited are:

1. Superfacial epithelioma of the ala of the nose.
2. Superfacial epithelioma of the right cheek.

3 and 4. Two recurring cutaneous ulcers of breast, post-operative.

5. Cancer of tongue.
6. Cystosarcoma of left lower jaw.
7. Tuberculous ulcer of wrist.
8. Lupus of superior lip.

In all these cases except in No. 5 there was positive cure within three to six months. In No. 5—cancer of tongue—the patient could not withstand the applications and tumor seemed to continue in growth.

ARCHIVES D'ELECTRICITE MEDICALE.

Bordeaux, France, September 25, 1904.

1. **Ions in Medicine—Stephane Leduc.**
2. **Cure of a Spreading Plane Vascular Naevus by Phototherapy—H. Bordier.**
3. **Electrical Treatment of Facial Neuralgia; Improvement in the Method—A. Zimmern.**
4. **Treatment of Arteric-sclerosis by D'Arsonvalisation—A. Moutier.**

1. The author states that the actions of ions may be classed as local and general. The general actions are of utility to the physician and toxic as well as therapeutic doses may be given by electrolytic processes through the skin. With constant density of current the general effects of ions are multiplied by increasing the surface of the electrode. With the present mode of introduction, the medicinal ions are added to, while by the electrolytic method they are substituted for the normal ions, while toxic or injurious ions may be eliminated from the body. The process must be carried on in as careful a manner as asepsis.

Local action must be effectually circumscribed and the application made through an opening in gummed taffeta. These local are most important as they permit of the introduction into each cell of the whole series of ions and also of

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as many different actions as there are kinds of ions. Experimental results show that the actions vary not only with the ions, but also with the dose. The pain due to the introduction varies with the several ions, some being extremely painful. The zinc ion has proven to be an exceptionally good antiseptic experimentally. In local anaesthesia with cocaine and stovaine the method is not practical, while the salycilic ions are very well supported by the tissues. Author disagrees, by reason of his own experiments, with the general opinion that the electrolytic action is proportional to the quantity of electricity. He finds that the action is proportional to the intensity of current. The action of the ions on the resistance of the body is dependent on the number and nature of the ions and not on the state of humidity and vascularity of the skin. In his studies he found that the ions were susceptible of a variety of actions, caustic, antiseptic, coagulating, of modifying sensibility, conductibility, and vitality, and all may be utilized. One of the most effective therapeutic actions of the continuous current is its resolutive action on ankyloses and sclerous formations, the action varying with the amount of soft tissue covering the part. Extremely good results have been obtained with the salycilic ions in the treatment of left sub-axillary dry pleurisy. In five cases experimented on cures were obtained by two or three applications.

2. The naevus was made up of two red spots parallel to naso-labial groove on right cheek. Behind were several small dots. The lesion was what is known as "wine-colored."

Prof. Maine's apparatus was used, compressor being of same size as naevus, and healthy tissue protected by tinfoil. Rubber bands of apparatus pulled tightly together until cutaneous surface appeared white.

This compression the author considers as the principal agent in obtaining cure. Intensity of current sixteen to eighteen ma., time of application one hour. Parts burned allowed to be eliminated during about ten days and treatment repeated. After four series of applications the naevus entirely disappeared. Each application gave inflammatory reaction. The entire course of treatment lasted three months.

3. In mild cases of neuralgia permanent cures are frequently obtained. In serious cases on the contrary there is is usually a recurrence of the attack, not as intense, however. If preventive applications are made for ten days every two months the recurrence is rendered less frequent and less intense. Applications were made with the facial plate of Bergonie and each one lasted one hour with an intensity of five to fifteen m/a according to the case. A patient can make his own applications under the direction of the physician. The results are slow to be manifest.

Experiment on neuralgia loco-dolenti by hydro-electric injections in the nostril or in the jugo-gingival canal. A vessel filled with 1-1000 normal salt solution is connected by a rubber tube to a canula as used in nasal electrisation. For intra-buccal applications, the canula is elongated and flattened to force a flattened jet into the jugo-gingival canal. A silver wire runs inside the tube. Positive pole is attached on the edge of the vessel while the negative is applied at back of neck. The mucous membrane is sprayed over with the jet for an hour at a time while

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the current passes through, having an intensity of five to ten m/a. Canula must be kept moving. No exact results obtained but positive relief has been observed in cases of mild neuralgia.

4. The good results obtained of late in the treatment by D'Arsonvalization are undoubtedly due to better instruments. All results herein given have been obtained by one of the two following instruments. No. 1, made up of a coil of 25 cm. spark, a Contremoulins-Gaiffe interruptor connected with city current by a rheostat, a petroleum D'Arsonval condenser and a large solenoid. This instrument is not portable. No. 2, constructed of a Gaiffe transportable coil with atomic rupture in communication with an accumulating battery on one side and a D'Arsonval petroleum condenser on the other, this last being connected to a large solenoid as in No. 1.

D'Arsonvalization causes a fall of arterial pressure, after the first session, of three, four, five or even six cm. of mercury. It rises again to fall at the second session about three cm. and this gradually diminishes to the normal. Never was the increase less than 15 cm. Hg., or present before treatment. It is considered that the hypertention of the vessels has been reduced to normal when the pressure is back to 15 cm. Hg. In regard to rapidity of reaching this normal pressure, the patients have been placed in four groups; first, where it required seventeen sessions to reach normal; second, thirteen; third, eight; fourth, five, respectively. The rapidity with which pressure is lowered seems to depend on none of the following: gravity of case, age of the arterio-sclerosis, or degree of hypertension, but more upon the hygiene and diet of the patient. In regard to technique, two points must be observed, the length and frequency of each application. They must be of from five to fifteen minutes' duration and two or three times a week. Laxatives and diuretics should be uesd. Without accidents of any kind all cases so treated have been improved. It has been shown that by reducing hypertension the evolution of arterio-sclerosis is checked and often a cure obtained.

JOURNAL DE PHYSIOTHERAPIE.

Paris, France, September, 1904.

1. Methods of Electrolytic Dilatation of Urethral Strictures—Dr. J. Aversenq.
2. Present Status of Radiotherapy—Dr. R. Kienboeck.
3. Employment of Thermo-therapy in Gynecology—Dr. G. Bloch.
4. Applications of Therapeutic Baths. Medical Properties of Hot Minero-Sulphur Waters—Dr. Senac-Lagrange.

1. Two methods are used. One in which the electrolysis makes use of mechanical dilatation and is a slow method, and one in which the electrolysis is adjunctive only to mechanical dilatation and which is a more rapid method. The current dose should not exceed one and five-tenths coulombs per square centimeter. A small dose of electricity gives as an immediate result increased dilability and as a later result, absorptive changes in the cicatricial tissues.

In both methods the negative pole is attached to the electrode, and the treatments are given every eighth day. The rapid dilatation wherein the electrolysis serves only as an adjunctive function, is applied every eighth day, and about three Beniques bougies of increasing size are introduced consecutively at each treat-

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ment. The electrolytic or slow method in which the mechanical dilatation is secondary to the electrolytic action exhibits all the advantages of simple dilatation, and is superior to it in all cases.

2. See "Archives of Electrology and Radiology," this issue, page 429, abstract from Fortschritte auf dem Gebiete der Roentgenstrahlen for August, 1904.

FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRAHLEN.

Berlin, Germany, July, 1904.

1. Investigations of Moeller-Barlow's Disease (Scorbutus)—Eugene Fraenkel. To be continued.
2. Diagnosis of Adhesions of the Pleura to the Pericardium and Diaphragm—Stuertz.
3. A Case of Brachydactylia of All Extremities—K. Hochheim.
4. Brain Abscess in the Roentgen Picture—Straeter.
5. The Motion of the Organs of the Throat During Effort—P. J. Eijkman.
6. Contribution to the Technic of Roentgenphotography of Urinary Calculi—A. Stein.

2. Although small adhesions of the pleurae are not visible either by transillumination or on the plate, radioscopic examinations are of importance especially in disturbances of the heart and lungs, which cannot be explained by the ordinary physical methods. According to Stuertz this is the only safe and only reliable method in cases where pleuritic adhesions are attached to the convexity of the diaphragm.

6. Stein used the very simple device first recommended by Witteck of Graz in order to give a better photographic reproduction of urinary calculi. It consists in blowing in about 150 ccm. of air into the empty bladder of the patient before taking the picture.

FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRAHLEN.

Berlin, Germany, August, 1904.

1. Investigations of Moeller-Barlow's Disease (Scorbutus), concluded—Eugen Fraenkel.
2. Radiography of the Larynx—L. P. H. Eijkman.
3. Apparatus for the Fixation of the Head and Extremities—Straeter.
4. On the Effect of Roentgen and Radium Rays upon Internal Organs and the Whole System of Animals—Seldin.
5. Large and Small Roentgen Apparatus—Rosenthal.
6. The Present Status of Radiotherapy—Kienboeck.

1. Fraenkel has seen nine cases of Moeller-Barlow's disease (scorbutus), all of which he subjected to postmortem examination and did it in a very thorough manner. Of interest is not only the exact anatomical and microscopical description of these cases, but also the Roentgen pictures showing the structural changes of the bones, etc. This is a thoroughly scientific paper, which everybody ought to read who is interested in the above disease.

2. This article is of interest for the study of the physiology of the larynx, giving many new points of importance in this connection.

4. Seldin has repeated many experiments of his own. He comes to the following conclusions: a. Under the influence of Roentgen and Radium rays small animals (mice) die; the smaller the animals the more susceptible they are to the rays. b. To produce an effect on larger animals (guinea pigs) more intense radiation is necessary. c. Under the influence of these rays the testicles

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of animals go into atrophy or degenerative processes. This occurs much quicker under the influence of radium rays. d. On the liver no visible changes could be noticed after radiation.

6. All living tissues penetrated by the X-rays sustain a pathological change in which the X-ray tube itself plays no part. Alterations best studied are those of skin and spleen, and the reproductive cells are those most affected. The intensity of a dermatitis will depend on the intensity of the application or rather the amount of rays absorbed at each application. The degenerative alterations are revealed only by the microscope a few hours after the exposure; the inflammation much later—two weeks or so after. There are four degrees of reaction. 1st. Latency of three weeks, no inflammation, temporary fall of hair, exacerbation of pre-existing congestions. 2d. Latency of two weeks, erythema and tumefaction of two weeks' duration, fall of hair. 3d. Latency of ten days, redness, vesication, erosion with exudation, and restitutio ad integrum in three or four weeks. 4th. Five or six days after application, necrosis, then ulceration and cicatrization after six weeks.

GENERAL TECHNIQUE.

A powerful coil of forty to fifty cm. spark was used with rapid interruptions and adjustable vacuum tubes giving rays of medium penetration. Applications lasted but a few minutes and tubes were brought as close as possible to the morbid surface. The whole surface must be acted upon. Healthy tissue surrounding lesion was protected by lead foil.

The dosage was estimated in various ways. 1st. By method as stated before for five to fifteen minutes. 2d. By Dr. Holzknecht's method; a little mug containing a solution which turns green under the action of the rays is placed in the focus near the surface acted upon. It serves as a chromoradiometer to show the exact quantity absorbed by comparing with charts. 3d. By Dr. Freund's method in which a 2 per cent solution of iodoform in chloroform is placed in a vial which acts as above chromoradiometer only turns red instead of green. The dosage in reference to frequency and number of applications depends on the susceptibility of the individual patient. The X-rays have also a stimulating action on cell growth.

SPECIAL THERAPY.

Group A.

Hypertrichosis of the face in women should be treated by the X-rays as it produces a permanent cure. Alopecia areata capitis is cured in certain cases with radiotherapy; when hair, eye-brows and beard are completely missing, it is, however, of no utility. Canities circumscripta are sometimes cured. In trichorrhexis nodosa affected beard is shaved off and one application causes the hair to fall and grow again in a healthy state. Mycosis favosa is treated as trichorrhexis with good results as is also mycosis tonsurous. Folliculitis and sycosis **barbae** are cured in one month if uncomplicated.

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Group B.

Acne rosacea, comedones, eczema, verruea, lichen ruber, prurigo, pruritis, hyperidrosis, psoriasis are all amenable to X-ray therapy.

Group C.

Acuminated condylomas, plane condylomas, gummata and ulcerating syphilis, tuberculous leprosy, trachoma of conjunctiva, lupus erythematosus, lupus vulgaris, scrofulo-derma. These are relieved, but rarely cured by radiotherapy. In tuberculous lupus the phototherapy of Finsen seems to give better results.

Group D.

Mycosis fungoides, epithelioma, carcinoma, sarcoma; these are generally cured although metastases may occur. Epithelioma on lips, alae of nose, and eyelids are generally permanently cured. Carcinoma of breast is relieved, but not usually cured.

Foreign Letter.

Breslau, Germany, October 4, 1901.

The number of the works on Radiology, published in recent months in Germany, is so exceedingly great that it is almost impossible to touch in a short review all its results. We will therefore mention only a few points from the various fields which we think important.

In phototherapy the experiments with eosin and erythrosin on infusoria and bacteria have been remarkable, first of all. It has already been noticed by Tappeiner, that infusoria in the presence of certain fluorescent substances would die quicker in the light than in the darkness. Dreyer has further developed these experiments from a different point of view and extended them to bacteria and living tissue. The experimental results have been most promising, and above all the very violent reactions which set in on the human skin, after an injection of an erythrosin sensitizing solution and a short radiation with the Finsen lamp, gave fair promise for a far extending therapeutical applicability. Continued clinical observations and experiences with this method showed, however, that the healing results did not come up to the expectations and that a practicably available method of sensitization in phototherapy does not as yet exist. Nor has the influence of fluorescent substances on ferments, toxins, etc., by radiation, established experimentally by von Tappeiner and Fodtbainer, found as yet a practical application. A satisfactory explanation of the observed occurrences has up to this time not been arrived at. Worthy of notice is the fact, ascertained by Straub, that a transmission of oxygen takes place by the influence of light on eosin.

The above mentioned facts suggested the investigation of the influence also of the Roentgen rays on tissue after it has been treated with esoin. Kothe (Münch. Med. Woch.) reports, that he has seen on radiated animal and human skin much greater effects after an injection of eosin, than without it. Confirmations of this statement are still to be waited for.

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The works of Heineke (Münch. Med. Woch.), who has examined the effects of Roentgen rays on the spleen and lymphatic tissue of animals, point towards a new field in Roentgen therapy. From these examinations it has been ascertained that the spleen and the lymphatic tissue of the employed animals (guinea pigs, rabbits, dogs) are extremely sensitive to Roentgen rays, that characteristic alterations set in, even with a dose of the rays which produces no visible alteration in the skin of animals, and that the latent period is much shorter, being only a few hours. These results would explain the influence of the Roentgen rays on leucemic and pseudo-leucemic swellings of the spleen and of the glands, and encourage to further therapeutical experiments in this direction. The effect of the radium rays on the spleen and lymphatic tissue is, according to Heineke, quite identical with the effects of the Roentgen rays.

As to the explanation of the effect of Roentgen rays on the skin the investigations of Linser and Baermann give entirely new points of view. They think that the effect is not due to a direct and primary damage of the epithelium cells, as has been believed so far, but that the alterations observable on the epithelium have their cause in a primary damage of the blood vessels, and that the alterations of the epithelium are therefore of a secondary nature. This heavy damage of the blood vessels also retards the healing process of Roentgen necrosis and is the reason why a cure does not take place at all in very intense cases. One can in such cases cure the necrosis successfully by transplantation. Linser has demonstrated several cases of this kind at the "Naturforschervenammlung" in Breslau.

The experiments with radium showed, that its effect corresponds for the most part to that of Roentgen rays and that it has besides the power of destroying bacteria which is wanting in the Roentgen rays. This power of destroying bacteria is, however, of no account for therapeutical purposes, as it requires such a long period of radiation, that it would cause a very heavy necrosis of the tissues. The field of usefulness of radium is a very limited one, it being applicable principally to epitheliomata on which excellent results can be obtained.

Finally we will briefly mention the mercurial lamp of Heraens of Hanaue, in which mercurial fumes are made to glow inside of a vacuum quartz tube by the electric current. By this a very intense light, extremely rich in ultra violet rays, is produced, which is able to cause a very heavy inflammation on the skin. This lamp was demonstrated by Halberstaedter at the "Naturforschervenammlung" in Breslau. The effect is naturally only a superficial one and therapeutical results are still to be ascertained.

The few specimens which we have given above show how many interesting and important points wait for their solution in Radiology and that we have still much work before us in this great and many-sided field.

PROF. NEISSER.
DR. HALBERSTAEDTER.

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Book Reviews.

THE PRACTICAL APPLICATION OF THE ROENTGEN RAYS IN THERAPEUTICS AND DIAGNOSIS.

By William Allen Pusey, A. M., M. D.,
of Chicago.

Professor of Dermatology in the University of Illinois, etc., and Eugene Wilson Caldwell, B. S., Director of the Edward N. Gibbs X-Ray Laboratory, University and Bellevue Hospital Medical College, etc.

Second edition, revised and enlarged.
William B. Saunders & Co., Philadelphia, Publishers.

This book is both practical and fairly conservative and without being unnecessarily diffusive gives an excellent survey of the field of X-Ray therapy and diagnosis. The author's experience has been extensive and while he speaks with authority, he is yet commendably guarded when touching upon the graver forms of malignant disease. This is right and proper for some of the claims that have been made for the efficacy of the X-Ray in internal malignant growths and deep-seated carcinomas are difficult to substantiate. In cutaneous carcinoma there is no question of the efficacy of the X-Ray, as many well-authenticated cases sufficiently attest, and in some intractable skin affections the author's experience confirms the experience of others, namely, that dermatology has in the X-Ray a valuable adjunct remedy. It is hardly necessary to say that in some skin affections where the X-Ray has proved efficacious, simpler methods are equally if not more effective and should be preferred. The idea that substances like water can be rendered radio-active by contact with radium and then used internally and locally for their radiant effect the authors very properly characterize as a bizarre suggestion. A table of sixty-nine consecutive cases of cutaneous carcinoma is given. It is especially valuable because authentic; the names of the physicians by whom the cases were referred being given in almost every case. Of these sixty-nine cases, fifty-eight or eighty-four per cent were symptomatically cured. The second edition differs little from the first aside from a brief review of the literature of the subject for the year 1903 and bringing down the history of the author's own work to 1904.

RADIOTHERAPY AND PHOTOTHERAPY INCLUDING RADIUM AND HIGH-FREQUENCY CURRENTS. THEIR MEDICAL AND SURGICAL APPLICATIONS IN DIAGNOSIS AND TREATMENT. FOR STUDENTS AND PRACTITIONERS.

By Charles Warrenne Allen, M. D.,
of New York.

Professor of Dermatology in the New York Post-Graduate Medical School; Consulting Dermatologist to the Randalls Island Hospitals; Consulting Gentio-Urinary Surgeon to the City Hospital; Member of the American Medical Association; The American Dermatological Association; The New York Dermatological Society, etc.

With the co-operation of MILTON FRANKLIN, M. D., Lecturer on Electro-Radiotherapy, New York Polyclinic Medical School; and Samuel Stern, M. D., Radiotherapeutist to Dr. Lustgarten's Clinic at the Mount Sinai Hospital; Clinical Assistant to the Skin Department of the New York Post-Graduate Medical School.

Containing 600 pages, illustrated with 131 engravings and 27 plates of colors and monochrome.
Published by Lea Brothers & Co., New York and Philadelphia.

The high position that the author holds in the medical profession is in itself

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a partial guarantee of the value of the book. It is well written, well arranged and well illustrated. He begins his work by defining the various terms used, and by reviewing the various theories as to the nature of the X-Ray and its effect upon the tissues of the body. A chapter is devoted to the methods of producing the X-Ray, and in this chapter the author compares the value of the static machine and the coil, believing that while the former has certain advantages in therapeutics, the latter is of more general utility.

The book is almost entirely devoted to the therapeutic measures, there being only 47 out of 600 pages devoted to radiodiagnosis; but in this brief space a good synopsis is given of the value and methods of using the X-Ray in diagnosis. Therapeutics being the aim, the author does not sacrifice detail either as to methods nor as to results.

The treatment is first considered in general, and then carcinoma, epithelioma, sarcoma and skin diseases are taken up in turn. In consideration of these subjects the work done by other men is briefly reviewed as to their methods, their results, and their opinions. The general literature of the subject has probably been more generaly reviewed than in any other work, and for this the author deserves to be commended. It gives the reader a broad and general idea of the subject, and places him in position to consult in more detail if he chooses.

In addition to the above diseases, more generally treated by the X-Ray, a brief space is devoted to the consideration of radiotherapy in ophthalmology, otolaryngology, and general diseases.

The dangers of the X-Ray are well and forcibly presented, and the medico-legal aspect of the Ray is given in brief notice.

The bulk of the work is devoted to radiotherapy and in this the author has shown enough good work to encourage the beginner, and enough poor results to hold the enthusiasm in check.

In the study of light, the physical properties, action on bacteria, and its effect in producing and curing disease are briefly considered.

Under "Actinotherapy" a fair idea of the physical effects of sun and arc light is given, together with the apparatus used, and the therapeutic results obtained.

The seventh part of the work is devoted to the study of High-Frequency Currents. He gives a brief history of these currents, their methods of production, their physical properties and physiological effects. The indications and methods of using these currents in the treatment of disease is treated more fully, and the author is rather enthusiastic as to their value.

In general, the book can be recommended to all who are interested in the subjects of which it treats.

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HIGH FREQUENCY CURRENTS AND FINSEN LIGHT THERAPY.

By John McIntosh.

Bound in cloth, one dollar; cloth, fifty cents.

This little book of one hundred and fifty pages, with some thirty-three illustrations, is devoted entirely to the consideration of the apparatus for the production and mode of application of the agents above mentioned. The illustrations are of distinct value and give a much clearer idea of the various modalities than could the text. Liberal quotations from various authors, are incorporated and Finsen's latest and unhappily his last report on the value and results of his life work, is printed almost in full. This is one of the most valuable features of this little work, and serves to atone for the evident advertisement which fills the rest of the volume.

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Archives of Electrology and Radiology

Vol. IV December, 1904 No. 12

Original Contributions.

THE STATIC MACHINE AND THE RADIOGRAPH.*

By John Townsend Pitkin, M. D.,
of Buffalo, N. Y.

Let us consider the static machine and the radiograph, as the end links of a chain, the intermediate segments thereof are the Crookes tube, the X-ray field, the photographic surface, the exposure, skillful development of the exposed negative, printing of the X-ray positive, development of the radiograph. It is necessary that each subdivision of the chain shall be thoroughly understood by the operator and that he shall employ implements, material and forces, specially adapted to the purpose and to each other. Failure to comply with all of the requirements, means a defective link, a failure or compromise in the results attainable, for our metaphorical chain conforms to the axiom, "A chain is never stronger than its weakest link."

The static machine is a continuous current generator or dynamo, the revolving plates and their support are the armature, the stationary plates and their inductors of tinfoil and paper are the fields, the collecting combs are commutators, the prime conductors the outlet of the external circuit. Two revolving and two stationary plates with their accessories, constitute a static unit, the value of which is proportionate to the number of square inches of the revolving plates, that can be electrically excited without sustaining internal leakage.

The static unit resembles a Leyden jar or condenser, the two coatings of tinfoil are upon opposite sides of the apparatus, the revolving plates that pass near them and are inductively magnetized, taking the place of the glass wall of the jar. The electrical capacity of this Leyden jar will depend upon the amount of foil, paper and glass that can be excited to saturation without overflowing.

Again the static machine is a double electrophorus, the primary charged discs of opposite polarity, covered with glass and resin are the stationary plates. The secondary discs or segments of discs inductively charged therefrom, are the revolving plates. The latter structures being constantly removed by turning, carry a bond or induced charge of electricity with them, to the opposite side of the machine, but give up a free electrical charge at the place of induction, which charge passes externally over the prime conductors, and internally over the neutralizing rod, conductors that are placed in constant electrical touch with the revolving members. Speaking more specifically of the disposition of the bond

*Read at the Fifth Annual Meeting of the American Roentgen Ray Society, at St. Louis, Mo., Sept. 8th to 13th, 1904.

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or induced charge carried by the revolving plates to the opposite sides of the generator, the prime conductors receive a major portion, the neutralizing system acting as a shunt, takes a minor portion, the inductors acting as a second shunt, receive a third portion, a distribution of the current which places the static machine in the classification of dynamos of the compound wound type.

In the complex static machine for X-ray purposes, a number of units, from ten to thirty or more, can be operated in synchronism, an arrangement similar in effect to the wiring of a group of battery cells in multiple relation to each other, to increase the volume or quantity of the electrical outflow. The complex static machine resembles the human economy in the symmetry of its formation, distribution of functionating parts in pairs, in the possibility of utilizing all available space for useful purposes. It has a body, arms, legs, a circulatory system, a voice weak, snarly and snappish, from the feeble generator, but strong, frank and sonorous from the more efficient. To the unsophisticated it seems possessed of a whimsical, even a mulish disposition, but in the hands of the experienced, it is an ever faithful and obedient servant.

Again, the static machine resembles a regiment of soldiers in the correctness and precision of alignments, in the definite position and relation its constituents bear to each other. During atmospheric disturbances, two clouds or a cloud and the earth become charged with opposite kinds of electricity, the intervening atmosphere is strained by a magnetic field of force, until the limit of its strength is reached, the dielectric breaks at the weakest point, a lightning flash and a crash, are the manifestations of the action of one of Jehovah's Leyden jars, the disruptive discharge of the static machine of the Omnipotent. Similarly when we operate several large static machines, in multiple relation to each other, we can can produce a thunder storm in miniature.

The force generated by the static machine is electro-magnetism, the conductors are electrified, the glass plates and the atmosphere magnetized. The high tension current is a property or attribute of the excited dielectrical material employed in its construction.

Should the physician desire to build a Holtz static machine for his own use, he will find it necessary to enlist under his banner a cabinet-maker to make the case or frame-work, a hard-rubber company to furnish collars and tubing, the tubing to cover the axle, prime conductors and neutralizing rod, a metal worker to make the steel shaft, brass boxes or bearings, great brass balls, the collecting and discharging rods. A few oak boards, two to four cases of window-glass, many hard-rubber pieces, a bar of steel, some brass tubing, a little brass fly screening and some scraps of brass, the last mentioned to be cast into balls and bearings, this heterogeneous collection of crude material in the hands of the artisans can be converted into the constituent parts of the static generator.

In order that the generator shall yield the operator a maximum quantity of electricity at the prime conductors, it is necessary that the material, electrical and dielectrical, from these diverse sources, shall bear a definite relation to each other in their conformation and arrangement. With this object constantly in the foreground, let us proceed to build an apparatus.

The framework of a static machine may be considered as an oblong box, from which enough of each surface has been cut away to convert the remain-

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ing portions into window casings. Only enough woodwork is left to be consistent with strength and firmness. Two central upright, wooden mullions, one placed anteriorly the other posteriorly, divide the corresponding facades of the case into two equal portions. These mullions afford a firm, unyielding support for the axle collars and revolving plates, they also contribute strength and firmness to the framework, they do not encroach upon valuable space in the interior of the case, they are lined upon the inside surface with hard-rubber sheeting as an insulation measure. One or both of the mullions can be removed and leather straps or clothes lines used as a temporary support, in case the revolving portions of the machine require repair or replacing. The case of the machine is completed by windows, two in front, two in the rear, one on either end, and one upon the top. They are made of thick beveled plate glass set in frames. Any or all of the windows can be easily removed to afford free access to every portion of the internal mechanism. The prime conductors pass through apertures in the center of the anterior windows, thus affording for those structures perfect insulation.

For purposes of description, let us consider first the revolving portion or armature, and subsequently the stationary portion, or fields of the static mechanism. My illustration shows the naked steel shaft, twenty-eight inches long, in situ, also the flanges of the plain brass boxes, and the upright wooden mullions. In the next illustration may be seen the shaft covered from flange to flange, with a hard-rubber sleeve, half an inch in thickness. A fine thread runs the entire length of the sleeve, to receive the hard-rubber collars, similarly threaded. The sleeve was firmly shrunk upon the shaft at the hard-rubber factory.

In the next illustration may be seen the hard-rubber collars, narrow and wide, six inches in diameter, they alternate with each other in position. The narrow collars measure half an inch, the wide collars an inch in thickness. Soft rubber packing is shown interposed between them. Large hexagonal nuts with set-screws are placed at the extreme ends of the hard-rubber sleeve to prevent the collars from turning laterally upon the axle, which would throw the revolving, the stationary plates and the collecting combs, all out of alignment with each other. When wooden collars are employed, or the shaft is not incased, the collecting combs must be made short to prevent sparking into the wood and axle, and more of the area of the revolving plates remain electrically inactive. Although the transverse inside measurement of the case is but twenty-three inches, twenty revolving plates are operated upon the axle without crowding or sustaining electrical leakage.

The revolving plates are twenty-nine inches in diameter, of which fourteen inches or an outer circle of seven inches is electrically excited, consequently the length of spark between the discharging rods is fourteen inches. To lengthen the external sparking capacity of our machine, it would be necessary to reduce the amount of each wheel that is electrically useful, and proportionately lessen the volume of the current, therefore we may enunciate as a law the following: All other things being equal, the length of spark from a static machine is inversely as to the strength of the current. When the wheels exceed twenty-nine inches in diameter, the warp of the glass interferes with proper alignment and a high velocity endangers their integrity. The interspaces for the collecting combs, between the revolving plates, are but one inch wide; this was found to be suf-

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ficient room, provided each collecting comb was made to accurately fit into the interspace in which it was to functionate.

The stationary plates, as is usual with the Holtz machine, are made of oblong pieces of glass, but instead of using single lights in the machine under consideration they are double, with the inductors of tinfoil and paper interposed between them. As the inductors are the fountain-head, or reservoirs of energy in which the electrical current has its source, it follows that the total capacity of these structures will govern the efficiency of the generator, hence the amount of tinfoil and paper that the double plates could carry without leakage was carefully determined. Large sheets of tinfoil and paper were attached to the glass and the machine tested in the darkened apartment, where internal sparking could be detected. Little by little the excess of the material was scraped away with repeated observations, until the external spark was of ample length and there

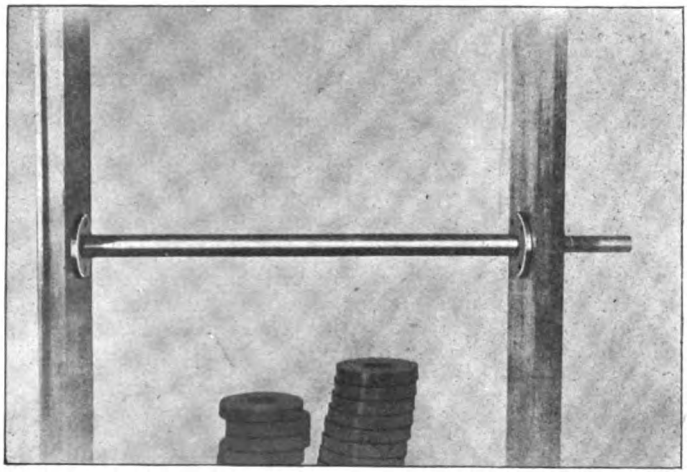


FIG. 1.

was no internal sparking. In this manner we were able to determine the maximum area to be seven by ten inches, for the foil, and seven by fourteen inches for the paper. On account of its electrical properties, carbon paper was substituted for the plain white variety.

The width of the fields once determined, other structures take their measurement therefrom. The width of the fields being seven inches the electrically active circles of the revolving plates would likewise be seven inches in width, the four sets of collecting combs must be seven inches long. Many other structures were made seven inches or some multiple thereof. The electrically inactive circles of the revolving wheels seven inches, the length of the external spark, 2x7, the width of the entire wheel a little more than 4x7, the length of the axle 4x7, the stationary plates including the interspace cut away between them 5x7 by 6x7, the window frames of the case front and back 6x7 by 7x7.

The stationary plates and their end frames are supported by six hard-rubber axles, threaded to receive buttons made of the same material. These axles are placed at the ends and middle of the apparatus, superiorly and inferiorly.

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The hard-rubber buttons screw up against either side of the end frames of the stationary plates to maintain those structures in perfect alignment. It may be observed that not any metallic parts enter into the formation of the machine, except the conductors and axle. To prevent sparking into or from the neutral-

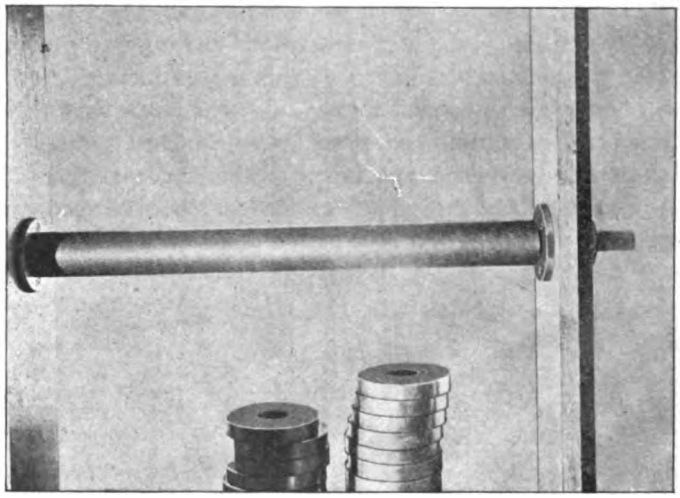


FIG. 2.

izing rod, that structure is incased in hard-rubber tubing. The four sets of collecting combs are separated from each other, ninety degrees of the glass circles, so as to maintain maximum segments of the wheels under the inductive influence.

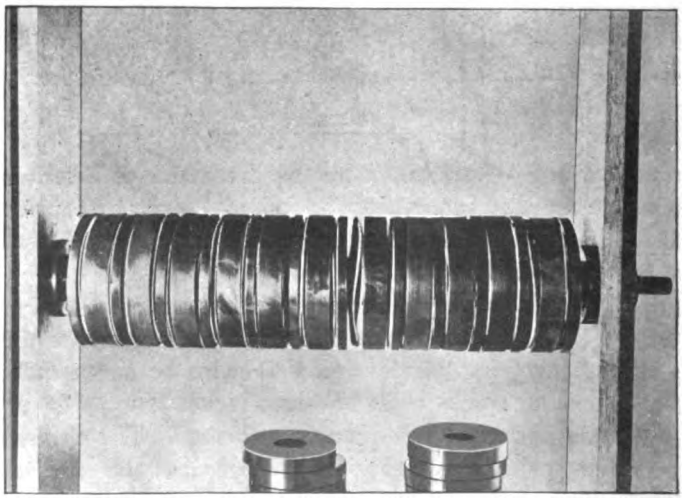


FIG. 3.

A separated drying chamber in the base communicates with the machine proper. It is filled with lumps of quicklime to absorb the moisture from the atmosphere, rendering the same anhydrous, thus keeping it in a workable condition.. The machine is made self-exciting by the play of tinsel covered collecting combs

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against the posterior revolving plates. Small pieces of wire connect the same with the neighboring inductors. A turn or two of the axle and the apparatus is always ready, summer and winter, spring and autumn, to generate.

Contrast the convenience of the case described in this article with removable windows on every side rendering all portions of the mechanism accessible for adjustment, repair, cleaning or the correction of alignment, with other cases all sealed up from which only the ends are removable. Contrast the working of a static machine having perfect insulation of the shaft and conductors, with another having wooden collars, a partially naked axle, with its prime conductors passing through the wood work. Is your machine poorly built from an electrical standpoint? Darken the operating room, open wide the discharging rods, and observe what is taking place. On the outside the spark diminishes in size, density and intonation, perchance it is entirely lost. Now look inside of the case, observe the pyrotechnoidal display, a veritable Independence day celebration, such as would accompany the discharge of crackers, bombs, pinwheels and rockets commingled with a pandemonium of comets, shooting stars and nebulae from the heavens above in miniature. Is your machine well constructed from an electrical standpoint? If so, under the same conditions the spark will not fall off, on the outside and on the inside only the beautiful positive blue or brush discharge at the negative and the fine whitish blue point or negative discharge at the positive collecting combs are discernible, all other portions of the interior are clothed in the profoundest darkness.

Contrast the static machine which has collecting combs seven inches long, taking electricity from seven-inch circles of the revolving plates with another machine having but three, four or five inch collecting combs, taking current from equally narrow circles. A machine with one hundred and eighty degrees or two segments of ninety degrees each of the circles under the influence of induction, with another which has but ninety degrees or two segments of forty-five degrees each of the circles under the inductive influence. Compare the poorly constructed machine from a mechanical standpoint that goes thumping, bumping, squeaking, scratching, screeching, always out of repair, always out of alignment, with a well-constructed instrument having all its parts accurately proportioned and fitted to each other with perfect alignment, working as noiselessly as the turning of the heavenly bodies in their orbits.

Compare the self-exciting apparatus, with its separate drying chamber always ready to respond to the will of the operator, to the lethargic apparatus affected by humidity, requiring a separate charger, refusing to work during the months of summer, and intermittingly during the other seasons. Compare the relative volume of electricity and X-radiance from a machine twenty-three inches wide, containing six, eight or ten revolving plates, with another having twenty revolvers placed in a similar frame-work.

The first cost of two or three large static machines to be operated singly or in multiple relation to each other may be considerable, but they will prove economical in the end, because with such machines we have ample area of glass surface under electrical excitement, consequently the electrical outflow is abundant without running the apparatus at a high velocity, and spark gaps can be omitted from the circuit, thus the wear and tear upon the mechanism and the strain

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upon the tube is minimized and the danger of puncturing the tube almost negligible. For the speed of a static machine to accomplish a given result, must be inversely as to the number of square inches of the dielectric in the revolving plates under electrical excitement, and spark-gaps are a makeshift to bolster up a feeble current. At a given speed each revolving plate in the static machine contributes its quota towards the amount of contrast and detail with sharpness attainable in the completed X-ray picture.

Owing to the short duration of exposure at greater distance from the tube, the danger of burning the patient is also almost negligible. The earning capacity of the larger machine is greater because the therapeutic effects and the radiographs obtained therefrom are superior.

Now other factors in radiography besides the generator are to be considered, for the machine may be ever so powerful, its outflow ever so abundant, but if other factors are unfavorable, its usefulness will be correspondingly limited, even nullified.

THE SECOND LINK IN THE METAPHORICAL CHAIN LEADING UP TO THE RADIOGRAPH IS THE CROOKES TUBE.

Tubes are usually placed in three classes, namely, hard, medium and soft. A soft tube is a synonymous term to a low tube. A hard tube is a similiar term to a high tube. This classification should be based upon the amount of residual gas they contain, the length of spark a tube can back up and the manifestations of the tube under electrical excitement. These factors should be considered collectively, because a tube that is high in action when attached to a powerful generator, may become medium in action when excited by a feeble instrument. A tube that is high in action with a number of spark-gaps in series, may become medium in action when the spark-gaps are omitted. A tube which is high in action when the generator is run at a high rate of speed may become medium in action when the speed is much reduced. The length of spark a given tube can can back up taken abstractly is not necessarily a measure of its hardness; the same tube may back up a four-inch spark when attached to one machine and five or six-inch spark when attached to another, although both machines are operated at the same rate of speed. A medium tube containing a relatively large amount of residual gas rendered high in action by the employment of a powerful generator to excite it, is the combination most desirable for radiographic purposes. The Crookes tube for X-ray photography to be excited by the static machine should answer the following description: High in functional activity, eight inches in diameter, just a little hard to start, the green and transparent hemispheres clear, steady, well-defined and uniform, without shifting or flickering of the green fluorescence, the target red throughout with a whitish red center, a green scintillating, radial aurora borealis, the cathode and the anode streams invisible; no blue cloud should hover behind the target; the concave surface of the cathode cup should have a light blue, central transparent spot, about the size of a silver dime with a narrow band of colors at the outer border of the blue in the order and of the nature of the solar spectrum. Such tubes become rapidly covered with dust and carbon upon all portions of their exterior, and with a transparent blue deposit upon the interior of the active hemisphere. While in action they are enveloped on every side in a magnetic field, which electrically charges all objects

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in the neighborhood. The height of vacuum of a Crookes tube should be proportionate to the feebleness of the generator; when the vacuum is a little low for the generator a series of spark-gaps will bring the tube into proper height of action. A relatively low tube becomes high in action when excited by a powerful generator, under such conditions the X-rays obtained are of the superlative degree. In the interior of such tubes there is impressed into the convective discharges constituting the cathode and the anode streams, residual gases, gases of volatilization, and possibly gases of transmutation. Such tubes can be made instrumental in the production of beautiful X-ray pictures of quality, having perspective and that are rich in contrast and detail.

THE CROOKES TUBE AS A CENTER OF DIVERSE FORCES.

The Crookes tube is directly connected with a multiplicity of forces. There is positive and negative electricity on the electrical conductors; the tube is enveloped in a field of magnetism; it is surrounded by electrically charged bodies, it has ordinary light from the target, the sun's rays or artificial illuminant, a green fluorescence of the active hemisphere and the positive aurora, heat rays from the target, the glass wall of the tube and the atmosphere, cathode and anode rays in the interior of the tube while on the exterior there are X-rays, fluorescent rays and rays of secondary illumination from objects upon which the X-rays fall; there is chemical force acting on the interior of the tube upon the residual and volatized gases and chemical action on the outside of the tube affecting the atmosphere, the tissues of the patient, the operator and the photographic material.

AUTO-REGULATION OF THE CROOKES TUBE.

If the operator has a relay of from fifteen to twenty-five tubes all in perfect condition, which he keeps near the ceiling of the operating room (the warmest portion of the apartment) and he divides from three to five hours of daily service between them they will maintain a nearly uniform vacuum. Tubes so handled will not require baking or auxiliary bulbs to lower the vacuum, their power of penetration and photographic ability once known by experience, become nearly constant factors. Herein lies the certainty of definite photographic results, and absolute safety to the operator and patient, for what the tube has done before, it will under similar conditions do again. Knowing what the tube can accomplish it becomes absolutely unnecessary for the operator to enter the X-ray field for any purpose, in connection with the taking of an X-ray picture.

AUTO-ANNEALING OF TUBES.

Auto-regulated tubes become in the course of time auto-annealed, such tubes operated by the continuous current of a static machine are seldom punctured.

CONDUCTING WIRES BETWEEN THE CROOKES TUBE AND THE MACHINE.

When a tube enters the service conducting wires are attached to the polar eyes once for all, they are never detached therefrom as long as the tube retains its usefulness. When the tube is at rest the wires are neatly coiled up, and left fastened to the polar extremities. In this manner all strain or traction on the delicate eyes for attachment is avoided.

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THE THIRD LINK LEADING UP TO THE RADIOGRAPH IS THE X-RAY FIELD.

Its nature, place of origin, course, strength and properties deserve brief consideration.

As to the essential nature of the X-rays little is known except that they are a specific form of radiant energy or radiant matter. To determine the place of generation of the Roentgen rays whether in the glass wall of the tube or from the target, to determine the rate at which they diverge from each other, the amount of magnification they would give objects with various distances between the objects and the photographic surface, we may place a vertical copper plate, having an aperture one-half an inch in diameter, six inches from the glass wall of the tube. We next place an observer with a fluoroscope in his hand one foot beyond the vertical plate or one and one-half feet from the tube. The observer will see upon the fluorescent screen a bright spot one and one-half inches in diameter; at two feet from the tube it will measure two inches; at two and one-half feet two and one-half inches; at four feet four inches, etc. In other words he will be able to outline a conical or cornucopia shaped pencil of X-light, which has its apex resting upon the glass wall of the active hemisphere. This little experiment proves conclusively that the X-rays are equi-divergent, that they diverge from each other at the rate of one inch to the foot, and that the glass wall of the tube is the place of their generation. From the cone-shaped pencil of light we can form a gradient scale for comparison, and obtain by computation from the apparent the real size of objects radiographed. The entire X-ray field may be considered to be made up of innumerable cone-shaped pencils of light, with their apexes resting upon the glass wall of the tube, their trunks extending outwards into space, their bases at infinity. Objects to be radiographed should be placed so that they will bisect these cones, i. e., in a position normal to the rays. A conical metallic structure of the dimensions given above, the large or distal extremity, of which is covered with a fluorescent screen, that would become uniformly lighted throughout its surface when in perfect alignment with a given bundle of rays would serve as a useful index to their direction. Such an implement could be known as an X-radioscope.

THE SPECTRUM OF THE ROENTGEN RAYS.

The solar spectrum with its various colors, red, orange, yellow, green and blue, with the properties peculiar to each finds its counterpart in the spectrum of the cathode rays which may be seen depicted upon the concavity of the cathode cup. Although no color effects have been obtained which can be definitely attributed to the Roentgen rays, nevertheless they possess peculiar properties which seem to indicate that they likewise have a spectrum. Low tubes emit rays of low intensity and velocity, feeble in penetrating power, rich in fluorescent but feeble in actinic or photographic effects they are homologous to the red rays of the solar spectrum. High tubes give off rays of great intensity and velocity, with corresponding penetrating power, poor in fluorescent, but rich in therapeutic and actinic or photographic effects, they are the analogues to the violet rays of the solar spectrum. Under the influence of such rays the bones, flesh and surrounding objects become luminous by transmitted light and auto-luminous or radioactive by transformation of a portion of the X-light; the combined rays produce

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pictures showing tubercles, tuberosities, condyles, spines and trocanters, even the compact and cancellous formation of the osseous structures. If used to excess they cause burning or disintegration of the tissues.

The three varieties of spectra mentioned seem to differ from each other in degree rather than kind. The sun's rays are easily focused, the cathode rays less easily focused, the X-rays are not focusable. The solar rays are, relatively speaking, visible, the cathode rays are sometimes visible, sometimes invisible, the X-rays are always invisible. When white light is passed through a double convex lense, the luminous circular spot cast upon a screen or upon the wall will have the blue or more actinic rays in the interior of the circle, with an outer border formed by a play of the other colors of the rainbow. The same arrangement of colors may be seen upon the concavity of the cathode cup, and likewise the actinic rays or rays partaking of the nature of the blue rays of the X-ray field are found to occupy a central position.

VARIETIES OF X-RAY FIELDS.

An X-ray field can be rich or poor in rays of high penetration, it can be rich or poor in rays of a low degree of penetration. A synonymous term for a rich field is a dense field, and a similar term for a poor field is a thin field. A rich or dense field results when a medium tube is brought up to a condition of full functional activity by a powerful generator. A thin or poor field is the product of a high tube excited by a feeble generator. An X-ray field will, like the current that excites the tube that gives it birth, be continuous and uniform or pulsatory in character, the pulsations being transmitted from current to cathode rays, from cathode rays to anode rays, from anode rays to the X-ray field.

For purposes of comparison the continuous X-ray field can be plotted in straight lines, the pulsatory field in undulations, the height of each wave to be proportionate to the length of time between each pulsation.

Although these two varieties of fields seem to be the same to the X-ray operator, the photographic surface will detect the difference showing a little more contrast with the continuous than with the pulsatory variety.

THE RELATION OF THE FLUOROSCOPE TO THE X-RAY FIELD.

This instrument has a limited amount of usefulness, its revelations are indefinite, usually unsatisfactory. An an index of the photographic value of a given X-ray field it is unreliable; its continuous employment is dangerous to the operator and patient. Hence the expert operator will employ the fluoroscope less and less, the radiograph more and more.

THE FOURTH LINK IN THE CHAIN IS THE PHOTOGRAPHIC SURFACE.

In radiography advantage can be taken of the penetrating power of the X-light not only to transmit the light through the parts to be depicted but also into and through silver bromide emulsions of unusual thickness. For the attainment of the best results, an ordinary photographic plate with but one coat of gelatino-silver emulsion, is obviously inadequate. Soon after the discovery of the Roentgen rays, Carbutt of Philadelphia produced a special X-ray plate and later, a celluloid film, having two coats of silver emulsion. Now Seed of this city (St. Louis) and other makers, supply a special X-ray film, that is triple coated.

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Each additional coat of silver emulsion has increased the sharpness of contrast and detail attainable in the X-ray picture. That the limit in this direction has not been reached is shown by the distinctness of two triple-coated negatives taken simultaneously, the one superimposed upon the other. Until such a time as the photograph supply houses will furnish us with films still richer in silver we can obtain good results by thus superimposing two films at the time of exposure and in the printing process.

The other advantages that result from superimposing of films are manifold. One film becomes a proof or control of the correctness or errors of the other. One film may be mutilated by pressure of the patient, faulty manipulation at the factory, or in the hands of the operator. One film can be given to the attending physician or patient shortly after the exposure, the duplicate retained to file away for future reference. One film can be developed to a different degree or in a different manner from the other, i. e., the upper film for contrast and detail with sharpness, the under film for less contrast, but showing detail with a degree of flatness. A second exposure is seldom necessary.

THE ADVANTAGES OF CELLULOID FILMS OVER PLATES.

(1) The films are not liable to be broken by the superincumbent weight of the patient, neither are they subject to a similar accident from other causes.

(2) They can be superimposed without offering dense material for the rays to penetrate.

(3) They can be more closely approximated to the parts of the patient and to the equi-potential surfaces of the X-ray field, thereby lessening distance from the parts exposed to the sensitive surface, and minimizing distortion of the objects.

(4) They have less pinholes in the developed negative.

The disadvantages of the films are, they are more expensive, harder to keep submerged in the chemical solutions. During exposure they require a special backing of some dense material, such as a metallic plate or sheet of glass to act as an intensifying screen. When photographic plates are employed instead of films, the thicker the glass the better the results that are attainable.

THE FIFTH LINK IN THE HYPOTHETICAL CHAIN IS THE EXPOSURE.

In the exposure of the patient for an X-ray picture the following arrangement is customary: (1) The Crookes tube shedding vertical rays upon the parts; (2)an air space of from eight to eighteen inches, as a protection to the patient, all other portions are shielded by metallic screens; (3) part of patient to be exposed; (4) upper film with three coats of chemicals, in double black paper envelopes; (5) under film similarly wrapped; (6) copper or other metallic plate to act as an intensifying screen; (7) cushions to adjust film to the contour of patient's parts and when possible to the equi-potential surfaces of the X-ray field; (8) operating table.

RELATION BETWEEN THE DISTANCE FROM THE TUBE AND DURATION OF EXPOSURE.

The distance from the tube to the photographic surface will vary with the tube employed, the degree of its excitement, and the thickness and density of parts to be depicted, but if at a given distance from the tube one minute is the normal

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exposure, then the length of time required for normal exposures for other positions from the tube will be proportionate to the square of the distance.
square of the distance.

At a given distance from the tube, in a field of a given penetration the normal duration of exposure will be proportionate to the thinness of the field or inversely to its density.

INTENSIFYING SCREENS.

When the operator looks into the illuminated fluoroscope he will behold an indistinct outline of the anatomical structure; there is little contrast, little detail, the image is flat, not clear or well defined. To reproduce a picture of what is seen upon the fluorescent screen as a sample of X-ray photography seems undesirable. An intensifying screen that will increase both contrast and detail can be made of a sheet of copper, lead, iron or any other dense material, this screen is to be placed underneath the superimposed films and like them made to conform to the contour of the body of the patient. To test the efficiency of the dense plate, an exposure can be made with a portion of the negative placed beyond the plate, under such conditions the projecting portions will be relatively poor. The beginner who cannot recognize the differing properties of various tubes will obtain better average results with a tungstate of calcium screen than without one, but the quality of all of his work will be inferior. In radiography the fluorescent screen may be used to give a degree of flatness to the picture and lessen the sharpness of the denser shadows.

SKILLFUL DEVELOPMENT OF THE NEGATIVE.

High lights, shadows, half-tones, contrast, detail, quality, thinness, sharpness, flatness, density, transparency and perspective are descriptive terms employed in photography and radiography. Most of these terms are self-explanatory. When we place a black man and a white man side by side we have the greatest degree of contrast attainable. A black man beside a yellow man gives less contrast, the yellow man is of a half-tone color. In osteo-radiography contrast is the first and great desideratum. When the bones are depicted in black with a background of white they seem to stand out in bold relief, with the greatest degree of distinctness. Detail or the interspersing of various tones or shades with each other although of secondary importance in osteo-radiography is of paramount value in splanchno-radiography where tissues of little dissimilarity are to be distinguished from each other.

Contrast in the radiograph results from short exposures, in a strong high tension field, with or without spark gaps in series with the tube, of photographic surfaces rich in silver, followed by the use of strong solutions of the developer proper, with relatively small quantities of the accelerator. Of the various developers pyrogallic acid and hydrokinone are perhaps the most contrast producing.

Of detail there are two varieties, namely, detail with sharpness and detail with flatness and thinness. The former results from prolonged exposure in a strong and dense high-tension field of photographic surfaces, having many coats of chemicals, exposed over a metallic plate, slow thorough development in a weak solution of the developer proper and a relatively large amount of the accelerator. Of all the developers employed metol produces the greatest amount

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of detail. Detail with flatness results from short exposures in a thin high-tension field of photographic surfaces poor in silver bromide, the use of a fluorescent screen and under-development. Detail can be assured by placing the exposed negative in a primary bath consisting of a weak solution of potassium bromide or sodium sulphite.

A developing solution suitable to obtain contrast in the X-ray picture is the one, two, three mixture consisting of one drachm of the developer, two drachms of the restrainer (sodium carbonate) and three drachms of the accelerator (sodium sulphite) dissolved in a thirty-two ounce tray half filled with filtered water. The developer must be dissolved first, the accelerator second, the restrainer third. Of the various developers the operator can select from the following: Pyrogallic acid, hydrokinone, metol, edinol, pyrocatechin, eichonogen, amidol, etc. They can be used separately, half and half, or in various proportions according to the results desired. The amount of the chemicals entering into the developing and fixing baths can vary considerably without markedly impairing the results, consequently these solutions are often employed to develop many pictures at one time or at various times provided the developer is kept while not in use in well-corked bottles to exclude the air. When air has access to the developer, it will turn a dark brown color due to oxidation rendering the chemicals inactive. The hypo fixing bath must be kept free from developer, that would discolor the solution and stain the pictures. The hypo solution is kept clear by rinsing the negatives in plain water after they are taken from the developer and before they are placed in the fixing bath. Fresh solutions of the developer tend to give contrast, old solutions detail.

Density is the antithesis of transparency. It results from prolonged development of the negative; the front of the negative loses the image, becomes entirely blackened over and the back becomes quite dark. If carried to an extreme degree, the completed negative will appear to be opaque to the strongest transmitted light. Nevertheless, such negatives contain a picture having the greatest possible degree of contrast, but with little detail; some of the half tones have been expunged therefrom. The invisible or phantom picture can be printed in a very strong light upon sensitive bromide paper.

THE STORY OF THE DARK-ROOM TERSELY TOLD.

In the dark-room illuminated by the rays from the ruby lamp, the double black paper envelopes containing exposed negative are opened. The developing tray containing the simple, pure, thoroughly dissolved chemicals free from foreign substances and oxidized material is in readiness. A pair of Eastman's film developing clips seven inches long are attached to its narrow extremities. The film is uniformly submerged, sensitive side looking upwards. The weight of the clips holding the film beneath the surface of the solution, there it is to remain moved about by the handles of the clips, or the solution agitated by gently rocking the container. Soon the image in white with a black background comes indistinctly into view, nearly fades away from the front and can be faintly seen upon the back with the shadows reversed, then it is to be rinsed off in plain water. After the plain water it is placed in the fixing bath, consisting of a strong solution of hypo, there to remain submerged until all of the milky look has left the back, and the whites are transparent to transmitted light. After another

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rinsing in plain water, it is well, although not absolutely necessary, to place it for a few minutes in a saturated solution of alum. From the alum bath it goes again into plain water, there to stay for half to three quarters of an hour or until all of the unused soluble chemicals have passed into solution. The film is then to be held under a tap of running water to remove the chemicals which have crystallized upon its surface. Lastly the film is to be hung up by one of the Eastman clips which are still attached, or the clips can be detached and the film secured in a place free from dust to dry, the sensitive side looking outwards, fastened at the corners by glass-headed kodak push-pins made for the purpose.

Should the operator find it necessary to open the door of the dark-room while the negative is in the developing tray, he will find it convenient to employ a black tray, one size larger, to place over the retainer in order to exclude the daylight. After the negative has reached the hypo bath, such precautions are not as necessary. In the developing tray a normal exposure should show an image in about

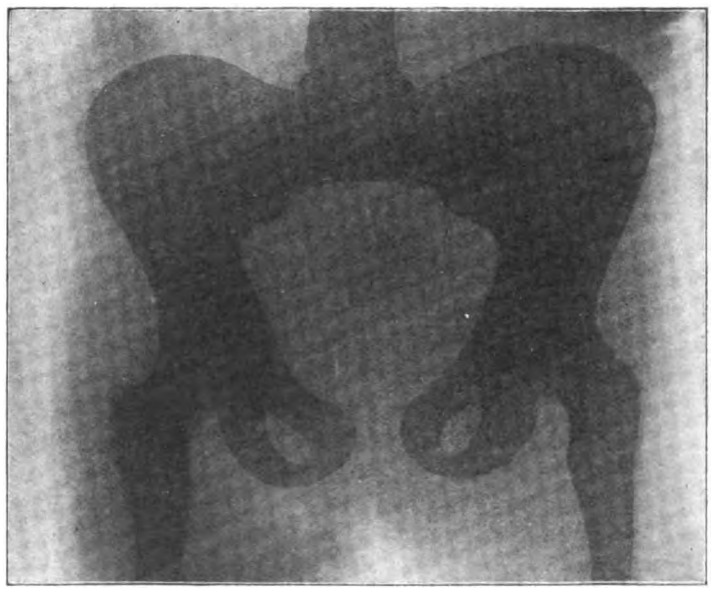


FIG. 4.

Bullet lodged in bony pelvis. near head of femur. A high tube was excited by static machine having but ten revolving plates, speed five hundred per minute. A series of spark gaps in circuit.

half a minute. If it comes up too rapidly it can be restrained by using a few drops of potassium bromide solution or more water can be added. If it comes too slowly it can be accelerated by the use of more developer. Spots that flash into view before the image appears are due to imperfections in the film, such as would result from small openings in the wrappers, faulty handling at the factory or undue pressure of the patient. The distinctness and persistency of the image in the developing solution denote quality of the negative.

INSPECTION OF THE FINISHED NEGATIVE.

When the beginner holds his first negative up before the light what does he behold? Perchance the negative is covered with innumerable small spots,

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looking as if the patient's integument was in the eruptive stage of small-pox, denoting that the chemicals were not thoroughly dissolved before he began to develop the latent image. Perchance the negatives are a goodly display of finger prints as if taken from the collection of Mark Twain's "Pudd'n-Head Wilson," caused by clumsy handling of the soft emulsion. He has not acquired the *tactus eruditus*, the knack of handling films and plates by their corners, backs and edges. Perchance the negatives are covered with unheard of organs, geographical maps, showing oceans and continents as yet undiscovered, lakes, rivers and all sorts of diverse objects, because the film was not thoroughly or uniformly submerged in the chemicals, the after-washing was incomplete, the patient may have pressed unduly or perspired profusely upon the wrapper.

His first negatives may be like the drawing of a lottery, many blanks, indicating that the rays have not penetrated through the parts of the patient; the tube was too low or under-excited, the developer inactive. The sensitive surface may be full of little pin-holes through which the transmitted light shines like the twinkle of as many little stars. Dust or other foreign bodies were not thoroughly removed from the sensitive surface or from the chemical solutions. Perchance in the course of time he will be able to obtain negatives free from all the foregoing defects, but the pictures are indistinct or lacking in contrast, because the generator is too feeble, the tube too low, the exposure too short or the tube at too great a distance; or again they were under-developed, the photographic surfaces may be poor in chemicals.

PRINTING OF THE X-RAY POSITIVE.

In the printing of the X-ray picture, the material, illuminant and time required will depend upon whether contrast or detail is most desired and the quality of the negative. If contrast is required and the negative has quality, the printing can be upon silver bromide paper, the exposure of which like the exposure of negatives results in the production of an invisible image requiring subsequent development. We would avoid the use of silver chloride or printing out, sun print papers. The bromide papers are thousands of times more sensitive and print in black and white, the chloride papers print in white and brown. We can select from any of the hard, gloss enamel, contrast yielding papers such as:

Platinoid carbon of Eastman.
Cyko Columbia Paper Co.
Nepera bromide of Nepera Co.
Argo of the Defender Co.
Azo of the Photo-Material Co.
Rotograph bromide by company of the same name.

Considerable experience is required to know just how long to expose a given variety of paper to a given negative with a given illuminant such as the solar rays, direct or diffuse, a Welsbach burner, an incandescent or an ordinary lamp, each one for each other requiring a specific time duration. A method for obtaining artificial contrast for one object, e. g., a bone to the exclusion of all others is to print the picture, then cut out the portion we wish to reproduce, paste all other portions onto the negative in their corresponding positions and print again. In the second print the object desired will appear free from the surroundings which would lessen its distinctness. When the negative has quality, such a pro-

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cedure is never necessary, the dense shadows will print distinctly, before the half-tones can print so as to obscure them.

To print an osteo-radiograph or splanchno-radiograph for detail we can select from the soft or mat-surfaced varieties of the papers already mentioned or what is still slower and consequently more detail-yielding some of the printing-out or sun papers such as Soleo, Kresco, Aristo or Platinotype. These papers again can be printed relatively fast or slow, depending upon whether the exposure is in the direct or diffuse solar rays, the action of either of which can be retarded by printing through a ground piece of glass. Minutes, hours, days, even weeks can be spent in the printing of such radiographs. The printing may be through a single negative, through two negatives superimposed, or through a transparent negative and positive of the same region.

Slow printing favors the entire picture coming in *en masse,* the half-tones with the denser shadows, *per contra* rapid printing is like the work of a landscape artist who does not wish to reproduce much of the detail. Printing for detail is not to be carried too far, for in the production of a given shadow, detail prints primarily, density leading up to obscuration secondarily, causing the bones to appear as if enveloped in a dense fog.

There is a sort of panoramic display of objects during the printing of the X-ray picture, some appearing while others are passing away. By arresting the process at various stages and making separate prints of each, all of these objects with varying shades of detail can be portrayed. Shading of the more rapid appearing portions of the picture during printing will hold it back, and allow the slower portions to come in.

Lastly the development of the latent image of the X-ray picture on bromide paper is similar to the development of negatives, but many operators prefer to apply the chemicals with a wide brush as if painting the solution onto the sensitive paper. In skillful hands the process can be used to bring out the picture so that all portions will appear to the best advantage, this is accomplished by giving the weaker parts a more liberal quantity of the developer.

TO RETRACE OUR STEPS FROM THE STATIC MACHINE TO THE RADIOGRAPH.

When the generator is feeble it may be run at a high rate of speed, we may employ a tube which has an extra vacuum, a series of spark-gaps can be introduced into the circuit, the patient can be placed a little nearer to the tube. If the tube is too low, the generator may be run at a high rate of speed, a strong generator used, a series of spark-gaps placed in the circuit, the patient nearer the tube. When the X-ray field is thin but penetrating the exposure must be prolonged, photographic surfaces rich in silver can be employed. When the field is of low penetration the patient must be near the tube. If the photographic surfaces are poor in silver bromide they can be superimposed at the time of exposure and of printing; such negatives require slow development.

We have found it desirable to use a powerful generator, a large tube fully excited and of a high vacuum, factors equivalent in ordinary photography to having the subject well lighted; the photographic surfaces rich in silver bromide, or plenty of chemicals to respond to the actinic rays; an intensifying screen of some dense material beneath the photographic surface; developers simple but of a character and to be so admixed as to bring out the desired proportions of the

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reduced or elementary silver; printing of positives in the ordinary manner or by superimposing films, plates, etc., in such a light and upon such paper as is especially adapted to the quality of the negatives and the relative degree of the various shadows to be reproduced; development of the radiograph for contrast or detail like the development of the negatives by specially adapted chemicals carefully manipulated and proportioned. We have further found that with the favorable conditions just enumerated that rapid exposure, rapid development and rapid printing yields pictures having contrast, while prolonged exposure, prolonged development and prolonged printing yield pictures rich in detail.

Publisher's Notes.

It is with many feelings of regret that the present publisher disposes of a journal which has been his pride, and in which he has put his most earnest effort for four years. When this journal was first established there was only one other journal in the country devoted exclusively to electro-therapeutics. The discovery of the X-Ray had led to a demand for new appliances in radiographic work and had stimulated renewed investigation in electro-therapeutics. It was our desire to promote a scientific interest in the subject, and this journal has endeavored to present all the work done in its field of interest. As we turn over this journal to the new publishers, we wish to congratulate our readers on the enlarged scope of the combined journals and we can only hope for the new management as cordial a response as we have had from our readers.

The high standard of the journal is due to the efficient editorial staff, which has been loyal to the editor-in-chief in his efforts to give the most complete report of scientific research to be found in any department of Therapeutics. We extend to every one of these eminent men our most sincere thanks for their efforts in behalf of our journal.

This number of the Archives of Electrology and Radiology is also the December number of the American X-Ray Journal. Hereafter the two will be consolidated under the name of the *American Journal of Progressive Therapeutics*, and published by the American X-Ray Publishing Company, 1208, 55 State St., Chicago, Ill.

Miscellaneous Abstracts

ELECTRO-THERAPY.

GRAPHIC TRACINGS OF THE FARADIC AND OTHER INTERRUPTED CURRENTS.

Lewis Jones, British Medical Journal, October 8, 1904.

This paper deals ably with the oscillograph method of studying intermittent and other variable currents.

Many reproductions of the photographic results of the investigation are given and the evidence presented by these curves is conclusive.

The author refers to the apparatus which he has examined as a "medical induction coil." The limitation seems hardly necessary, as the results are valuable

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and certainly applicable to the induction coil in general whether used in electro-therapeutics or for investigations in pure science.

The present article is a continuation, with more modern appliances, of one on an investigation of the characteristics of the inductorium by the same author in 1892.

In many of the tracings of the present article the characteristic curves of the primary current are shown above those of the induced current; an arrangement which adds to the interest of the illustrations. The results are of much interest and value as showing the effect of the presence or absence of the iron core; also the results due to various kinds of interrupters.

For certain reasons the author seems to favor the use of currents coming from coreless coils, but says that "induction coils must have an iron core if they are to be operated by the ordinary vibrating spring contact-breaker." Surely this is not so, as many coils now are worked by an electro-magnetic vibrating contact-breaker *arranged in shunt circuit.* Such an arrangement would certainly work on a small coil as well as on a large one, if there were any good reason for omitting the iron core.

If by the oscillograph method an interrupted continuous current of the proper electro-motive force be examined, the results at once suggest that "there is no apparent reason why interrupted currents from other sources (than induction coils) should not be used" in diagnosis, and attention is called to the results of experiments by Dr. S. Leduc (Nantes) along this line.

Dr. Jones' article is very suggestive and full of good physics.

ACTION OF THE CONSTANT CURRENT ON THE VITALITY OF MICROBES.

S. Shatzky, American X-Ray Journal, September, 1904.

Observations were made upon pure bouillon or gelatine cultures of streptococcus, micrococcus prodigiosus, and the microbe of chicken cholera. These observations were conducted with the utmost care in order that modifying influences, such as raising of the temperature of the culture from heavy currents, etc., which were not inherent in or directly dependent upon the current itself, could be effectually excluded. The paper is a most interesting one and the results of his work detailed therein have led Shatzky to conclude as follows:

"First—That the constant current exercises in the inter-polar space a modifying influence on the vitality of the microbes.

"Second—That currents of twenty-five or thirty ma. applied for from one-half to two hours exercised an action varying from a weakening to an entirely inhibitory effect on their virulence.

"Third—That generations which develop from microbes galvanized in this manner develop a lesser vitality than their generators."

As to whether or not the same inhibition could be effected upon the germs if they were situated in the human body, as was observed by Shatzky when they were situated in the test-tubes, he considers that, as when they are located in the human body such germs are obliged to battle for their life against the vitality of the cells composing the organism, the effect could be greater. In a test-tube they have nothing to do but absorb nutrition and grow; in the human body they have not only to absorb nutrition and grow but to combat phagocytosis. As the constant current stimulates tissue nutrition, phagocytosis would also be stim-

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ulated, and the germs would be attacked from two directions; they would be weakened in some degree by the inherent and direct influence of the current as obtained in the test-tubes and the efficiency of the phagocytic attack would at the same time be increased by the same agency.

PRINCIPLES OF ELECTRO-THERAPEUTICS.

T. Proctor Hall, American X-Ray Journal, September, 1904.

This article is a most graphic and interesting account of the physical conception of the electric current and the phenomena of electrolysis and phoresis. The various sensory phenomena which are produced, the stimulant influence upon muscular tissue, and the degree and manner in which the psychological element enters into the beneficent influences of electro-therapy, are interestingly set forth.

The X-rays are believed to be electric waves corresponding to some extent to waves of light and clinical observation indicates that the effects of light and electrical waves are very like those of alternating electric currents, especially high-frequency currents. Their influence then, would be irritative, and the logic of the treatment of abnormal growths by electric waves is based upon the fact that abnormal cells are less resistant to destructive influences than normal cells; consequently an irritation not sufficiently intense to destroy normal cells might be strong enough to destroy abnormal cells. The essential feature in applying such treatment successfully then would be the administration of a stimulation intense enough to gradually destroy diseased tissues, but not strong enough to injure normal tissues.

Only those rays which are absorbed by the tissues do work; those that pass clear through are wasted. The general effect of radium is similar to that of electric waves of low penetration.

The known effects of electric currents which may be utilized in varying degrees by the use of different currents and methods of application, may be summarized as follows:

1. Heat.
2. Magnetism.
3. Radiation.
4. Induced currents.
5. Electrolysis and phoresis.
6. Neuro-muscular stimulation.
7. Sensory reflexes.
8. Ideation.

ELECTRICAL RAYS.

H. H. Roberts, Kentucky Medical Journal, October, 1904.

Probably nothing that has occurred in the medical world within recent years has attracted greater interest or excited greater enthusiasm than the therapeutical and diagnostic development of the various forms of radiant energy. The X-ray is one of the greatest aids to diagnosis, not only of foreign bodies, but of various diseased processes affecting the bone and many of the soft tissues, that has ever been discovered, and its use in various fields and the results obtainable therefrom are cited to prove this statement. Even œsophageal stricture, pleuritic adhesions and spinal hemorrhage can now be diagnosticated by it.

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The enthusiasm which has marked the *therapeutical* development of radiant energy, however, has exceeded greatly that which was created by the discovery of its diagnostic powers. Roberts believes that the X-ray has unquestionable therapeutic value, but believes that it is often undeservedly lauded as a remedy for many conditions. Epithelioma, tuberculous glands, etc., are undoubtedly susceptible to its beneficial effects. Leukemia, both lymphatic and spleno-medullary, is favorably influenced. Deeply-located growths in the uterus, stomach, liver, etc., are not believed by the author to give much promise of curative effects, and he pleads for reports of failures as well as successes in order to facilitate judgment.

The Finsen light is more beneficial in the treatment of skin diseases than the X-ray and the former rays are the only ones that have been ascertained to be bactericidal. What these rays are capable of doing, when produced from improved, less expensive apparatus, only the future can decide.

The great scarcity and enormous cost of radium prevent wholesale experiments with it. He considers that in it we possess a key which will open up new fields of study, and may result in great benefit to mankind.

SKENE'S METHOD OF ELECTRO-HAEMOSTASIS IN PELVIC SURGERY.

W. B. Pryor, American Journal of Surgery and Gynecology, November, 1904.

The name of Keith, of Scotland, is particularly associated with the use of hæmostasis by heat in the removal of massive abdominal growths. His method was to grasp the tissues to be treated with a powerful crushing clamp and then heat this clamp by the use of a piece of superheated iron. It was difficult to apply just the right degree of heat by this method and Skene of Brooklyn improved it by using electricity as a source of heat. The technique used is as follows:

"The vessels to be obliterated are grasped with heavy forceps, very much like the pile-clamp, adjacent tissues are protected either by means of a non-conducting shield or gauze pad, and as the clamp compresses the tissues a current of electricity is allowed to run through the clamp, heating it to about 190 degrees Fahrenheit. Taking an ordinary ovarian pedicle as an example, a fair compression is secured for one minute; then for another minute, more compression; and then for another minute more still, the instrument being all the while heated by means of electricity to 190 degrees. Upon removal of the clamp the pedicle is found converted into a tissue exactly similar in appearance to catgut; translucent, in thickness only one-eighth the original pedicle, perfectly dry and with the veins, arteries, nerves and muscular fibers all coagulated into one mass, in which one cannot be distinguished from the other. The softer the tissue, the slower should be the compression, and the less the time during which pressure should be applied."

Pryor does not consider that this method should be regarded as an absolute substitute for the ligation of large trunks, but it is a substitute for such ligation that offers advantages in some situations, among which may be mentioned the following: Double ovariotomy through the vagina, the removal of pus sacs, of septic dermoid cysts, of ectopic sacs, removal of hemorrhoids and rectal polypi, but it is found to give most satisfaction in abdominal work in that class of cases

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wherein ligation is undesirable, namely, soft tissue, edematous tissue, necrotic tissue, and septic foci.

The method also involves a great saving of expense as regards cost of instruments, etc.

RADIO-DIAGNOSIS.

THE ROENTGEN RAYS IN THE TREATMENT OF FRACTURES AND ADJUSTMENT OF THE FRAGMENTS UNDER THE EYE, BY USE OF THE FLUOROSCOPE.

Harry L. Gilchrist, New York Medical Journal and Philadelphia Medical Journal, October 22, 1904.

Dr. Gilchrist advises that the fractures be set directly under the observation of the fragments as seen through the fluoroscope. He places the part upon the top of a wood table, or upon a board, and places the tube beneath. The tube is then excited either by a coil or a static machine, and the fragments are drawn into position, as seen through the fluoroscope, which is held above. As a precaution against burns he advises that the table be covered with a rubber blanket which would not obstruct the rays in the least. The essential points found in its favor are the ability to see every movement of the fractured extremities during their adjustment, thus avoiding the necessity of giving an anaesthetic for diagnostic purposes; saving the patient many painful manipulations and the tissues from bruising and laceration by unnecessary handling. He reports in detail five cases in which this method was used with success.

RADIO-THERAPY.

VARIATIONS OF RADIO-THERAPEUTIC TECHNIC.

Russel H. Boggs, American Medicine, November 26, 1904.

From observation of the work of a good many X-ray therapeutists, Boggs concludes that good technic always produces good results. He divides physicians who are using the Roentgen ray under three heads:

(1). "Those who have made a careful study of electricity and physics and are able to duplicate results either in diagnosis or treatment.

(2). "Those whose work is chiefly confined to some other specialty and who use the Roentgen ray without making any claim or paying any particular attention to the subject.

(3). "Those whose work is done by the head nurse or some other inexperienced person."

The first and most important point involved in efficient technic is believed to be the distance of the tube from the patient. Most physicians are apt to place the tube too near the surface of the skin when treating deep lesions; the intensity of the light varies inversely as the square of the distance which should be taken into consideration when treating deep lesions. The formula worked out by Dr. E. G. Williams, which will be found upon page 167 of the May issue of the "Archives of Electrology and Radiology," is believed to offer a reliable and efficient rule by which to regulate the tube distance. For the treatment of lesions only skin deep, the tube may be placed at from four to six inches from the surface. Boggs considers that a ray of large volume should be used when deep lesions are to be treated.

Treatment of cancerous tissues is classed under four heads:

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(1). Cases of small epitheliomas which are situated on the face; these patients can usually be cured in from six to eight weeks with excellent cosmetic results.

(2). Cases in which the disease appears to be localized; in these cases, the mass should be removed at once and the region affected treated afterward by a few Roentgen ray applications.

(3). Cases with glandular involvement should be treated for a short time, thus curing as much of the disease in the glands as possible, then removed surgically, radiating afterward again. Twenty treatments before and twenty treatments after operation are considered to be all that will be necessary in these cases, and Boggs has had results by such management which could not have been bettered, either by surgery or the Roentgen ray when used alone.

(4). Inoperable cases of cancer; these should be treated by the Roentgen ray for the sake of securing its inhibitory action on the development of the disease and for the relief of pain.

Hygienic, dietetic and every other adjunct which promises benefit in the way of keeping the system in good condition should be applied with the Roentgen ray. Personal experience and good judgment are necessary in each case in selecting the means by which the most benefit for the patient may be accomplished. For the relief of the toxæmia which sometimes accompanies X-radiation of carcinoma, Boggs favors the use of the electric light baths to overcome this toxæmia. He always gives his patients from four to six grains of quinine a day for its tonic effect, and a pill of quinine, iron, arsenic and strychnine; a large amount of liquids should constitute a prominent feature in the diet. Each case must be treated according to the individual indications obtaining.

REPORT OF A CASE OF SPLENOMEDULLARY LEUCEMIA TREATED FOR NINE MONTHS BY THE X-RAY.

William Fitch Cheney, Medical News, November 5, 1904.

The patient was 27 years of age. His family and previous history were negative. Pallor, weakness and dyspnœa on exertion were complained of 18 months before X-ray treatments were begun. The physical signs and blood findings were those of splenomedullary leucemia. He was treated at intervals with quinine, iron and arsenic, but grew progressively worse. Five months after the beginning of the disease he had severe pains in the left side which lasted ten days. Fourteen months after the beginning he had a severe attack of epistaxis. To these symptoms were added disturbance of digestion and sleep, and marked enlargement of the spleen. Drugs seemed to have little influence and at the beginning of X-ray treatment all were stopped.

During the course of treatment both a static machine and the street current were used. The site of treatment was over the splenic tumor. The tube was soft, and at a distance of 8 to 10 inches. Treatment was given at first every day, then every other day. Once or twice the treatment had to be interrupted for a week on account of a dermatitis. During nine months the patient received 144 treatments.

At the end of the first week the patient reported that he could eat without abdominal distress, could walk further, and did not tire so easily. At the end of two months the patient reported that he felt perfectly well; he had lost his pal-

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lor, looked well, had gained ten pounds in weight, and felt none of his old symptoms of weakness, dyspnœa and abdominal distress. At this time the fluid in the abdomen had disappeared. At the end of nine months the patient is symptomatically cured, but the splenic tumor has not changed materially in size, though the tension has decreased. The white corpuscles have been reduced from 126,000 to 70,000. The red corpuscles have increased from 2,608,000 to over 4,000,000. The hemoglobin has increased from 47 per cent to 75 per cent. The myelocytes have decreased, but have not disappeared at any time.

The bad effects consisted of a dermatitis, but no constitutional disturbances were observed.

The case is reported simply to state facts, and not to uphold any theory.

THE ROENTGEN RAY IN THE TREATMENT OF SARCOMA.

Jos. F. Smith, American Medicine, November 5, 1904.

18 cases of sarcoma treated by Roentgen radiation are reported upon.

In case 1, a round-celled sarcoma of thigh and abdomen, some improvement was noted, but in this case Coley's toxins were used in conjunction with the ray. In a round-celled sarcoma of the eye, treated 24 times, there was some apparent improvement. An osteosarcoma of the metatarsal bone (recurrent) was improved and patient is alive after 2½ years, without a recurrence. The remaining 15 cases, with the exception of one lost track of, are dead. Most of the cases were deep-seated and recurrent, with large tumor masses. The technique was similar in all cases. A medium hard tube with series spark gaps was placed at a distance of two to six inches from the surface, and excited by the discharge from a 20-inch coil, turbine interruptor, 2 amperes at 110 volts in primary circuit. Screens of lead were employed and exposures of 5 to 20 minutes daily or every second or third day were given. In one case a severe burn occurred, in the others merely erythema followed.

The treatment has proven a disappointment in his hands, especially where large tumors were covered by skin or deeply seated. He advises thorough removal of the mass, followed by heavy doses of radiation. His cases were all hopeless from a surgical point of view. He admits the danger of metastasis or increased malignancy following operative procedure, yet hesitates to advise radiation, as he has yet to demonstrate that it has any certain or reliable effect in preventing metastasis or causing absorption of large and deep-seated sarcomas. He admits the efficiency of the ray in carcinoma and epithelioma, and reports a case of the latter, recurrent after six removals, that he permanently healed with a minimum of scarring by the ray alone. He has seen no large primary carcinoma of the breast disappear under the ray, but has seen recurrences spring up during active treatment.

A CASE OF HODGKIN'S DISEASE.

John V. Shoemaker, New York Medical Journal and Philadelphia Medical Journal, November 12, 1904.

Patient was a physician, fifty-two years of age, who had been in ill health for two years previous to his coming under treatment. Lymphatic glands had greatly enlarged during this period and he had lost twenty-five pounds in weight. He was emaciated, weak, and very anæmic, and suffered much from pain in the back. Heart action was rapid, pulse was soft and circulation poor, but the

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lungs were unaffected; lymphatic tumors as large as apples were present in both groins and right axilla; enlargement was also present in the left axilla and in the neck, varying from the size of a pea to that of a walnut. There was also a general enlargement of the lymphatic glands, but the tumors were not painful. The spleen extended a hand's breadth below the margin of the ribs, tumor as large as a fœtal head was present in the left side of the abdomen, and another about half that size upon the right side. There were indications that the mediastinal glands were also involved. Examination of the blood showed hæmoglobin 58, erythrocytes 2,440,000, leucocytes 5,200; two weeks later, hæmoglobin 55, erythrocytes 3,060,000, leucocytes 20,000.

The patient was placed under X-ray treatment, which was administered by Dr. G. E. Pfahler; exposures were made daily for a period of ten minutes, a high vacuum tube being used and the whole body exposed for six days. The tube was placed over the spleen and abdomen. The abdomen, left side, and back, were alternately treated. Dr. Shoemaker writes of the results as follows:

"It is difficult to draw conclusions from the results of treatment of a patient in the last stage of a heretofore incurable disease. The results in this case, however, were in some respects remarkable and are deserving of record. At the time of admission to the hospital the patient was very weak, as has been said, and complained of severe pain. As, however, he had been placed under the influence of morphine the effect of the X-rays in alleviating his pain could not be estimated.

"The glands began to diminish in size at the end of a week and at the time of death, which was sixteen days from the commencement of the treatment by Dr. Pfahler, they were only about one-third their original volume. This diminution affected the axillary, inguinal, and retroperitoneal glands. The spleen decreased gradually and on the day of death it had receded to the costal border. The skiagraph here shown demonstrated marked enlargement of the mediastinal glands. The autopsy confirmed the physical observations relative to the reduction of the size of the retroperitoneal glands.

"Such decided effects, obtained in sixteen days and in a moribund patient, are certainly striking and warrant more extended experiment. It is obvious that there must be much more hope for improvement in an early period of the disease. This belief is demonstrated by the cases which had remained in good condition for months after treatment had been discontinued.

"In the treatment of a case of advanced Hodgkin's disease (or cancer) with the X-rays, we are confronted with three distinct dangers: 1. There may not be time enough for the procedure to produce any benefit. 2. The danger of an X-ray burn. 3. The danger of a rapid disintegration of the new growths with the production of toxæmia."

THE RESULTS OF THE TREATMENT OF CARCINOMA BY THE ROENTGEN RAY.

J. N. Scott, American Medicine, November 12, 1904.

Scott's best results with the X-ray treatment of carcinoma have been with recurrent growths involving the breast. The next most favorable, primary growths involving the breast, then the uterus, stomach and intestines. He has several patients alive to-day who have had no treatment for two years and in

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whom all the clinical symptoms pointed to carcinoma of the stomach or intestines when they came under treatment. In three cases of carcinoma of the rectum no permanent relief was secured. Of fourteen cases of uterine cancer two have been well for two years, one of these having been operated upon, the other having had no operation. In eight of the other cases there was considerable relief of pain, lessening of hemorrhage, and temporary improvement in the general condition. The other four discontinued treatment, or showed no signs of improvement. Of eleven cases of primary carcinoma of the breast, diagnosis clinical, four are well at the end of two years or longer. Of fifteen cases of carcinoma treated by surgical extirpation primarily, there has been no recurrence after two years in ten. Of thirty-eight patients in whom there was recurrence after operation eight are well at the end of two years. In about half the cases which were operated upon, the diagnosis was microscopical and in most of the others the clinical features were so marked as to leave no doubt as to its being carcinoma.

Scott believes that all tumors operated upon and found to be malignant, except small epitheliomas of the face, should have a course of Roentgen radiation subsequently. If at the end of one month with small growths and two or three months with large growths there is no recurrence, patient may be discharged, but kept under observation, and if nodules make their appearance they should be again treated and the rays continued for a month after they have disappeared. He does not approve of administering morphine during Roentgen ray treatment, because it paralyzes the eliminating organs, and it is very essential that these should be kept active under such conditions.

He believes that preparations such as those containing iodine or mercury should not be used while the patient is under Roentgen radiation because they are liable to produce a dermatitis or to increase its severity if already present. If the skin is broken during a dermatitis, he applies zincstearate and boric acid with a plain gauze dressing over it. If the skin is not broken, he believes the best treatment is to let it alone. He prefers a coil almost altogether to excite the X-ray tube and uses an ampere and volt meter in circuit.

The tube is enclosed in an X-ray-proof box, one side of which is provided with an arrangement whereby any sized opening, from one inch square to ten inches, is obtainable. The box is suspended from the ceiling by a counterweight, which renders it possible to raise it or lower it to any desired positon. It is grounded so that if the wires come within sparking distance of it the patient will not get a shock if he should chance to touch it.

Cases are treated daily if serious, every other day if not serious; anode eight inches from the part treated; exposures for six minutes if treated every day, or eight minutes if every other day. Penetration of rays vary according to depth of growth under treatment. If penetration of half an inch is required, a tube which will back up a spark gap of one inch is used; from one and a half to three inches, a spark gap from one and one-half to two and one-half inches, and deeper than this, a spark gap of from two and a half to five inches.

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THE FINSEN LIGHT, X-RAY, AND HIGH FREQUENCY ELECTRIC CURRENTS, IN CERTAIN DISEASES OF THE SKIN; ANOTHER YEAR'S EYPERIENCE.

S. Duncan Buckley, American Medicine, November 19, 1904.

Bulkley has investigated the Finsen light treatment personally at Copenhagen, and claims that the reason others are unable to obtain the high percentage of successful results reported by Dr. Finsen is due to the fact that they do not possess the perfect technique which a long experience at the Finsen Institute has shown to be necessary. He reports a patient at Copenhagen who had received 721 hours' treatment. As this requires the constant attendance of a nurse and the expense of a current of some 75 amperes for the same length of time, it explains why so many attempts have been made to use different and stronger lamps and shorter sittings, the results, however, in such attempts not being good. On account of the difficulty attending the treatment, the service of an attendant, etc., being necessary, and the fact that results from the Roentgen ray have been so favorable, it has not seemed to him worth while to waste the great amount of time required for the Finsen treatment, and he has not yet tested the complete Finsen outfit which he brought from Copenhagen a year ago, and only expects to do so when other methods fail.

He reports 170 cases treated during the last year by radiotherapy. There were 71 cases of epithelioma, 8 of which were recurrent; 7 discontinued treatment early, 11 hospital patients were unimproved, 24 improved, 29 were clinically cured. Of the unimproved cases some were of very long standing and very extensive. Of the 8 recurrent cases, 2 discontinued treatment, 4 were improved, 2 clinically cured. In epithelioma of the lip he believes that a radical surgical operation is generally to be preferred, although he reports an excellent result in one case under radiotherapy. Three patients with lupus vulgaris have done remarkably well under radiotherapy and appear to be cured. Some points, however, can be detected by means of pressure with a transparent spatula. Six hospital lupus cases are reported, five of whom improved and one did not under treatment. One case of Keloid has steadily improved. A large number of cutaneous lesions have been treated. His therapeutic work has been done with a static machine exclusively, using Queen tubes, with a medium degree of penetration.

He reports the use of high frequency electricity for the treatment of various cutaneous diseases and has found it to be very efficient in many instances. A favorite use seems to have been for the removal of warts and pigmentary moles. An application of the current with a carbon electrode produced a moderate inflammation following which the wart disappeared without a scar. In case of pigmentary moles, however, it has been necessary to make several applications. He reports a good result in a case of extensive port wine mark upon the face of a girl of 24, who had been treated in a variety of ways. The results of the application of hyperstatic electricity in some 21 sittings was restoration to normal color of considerable areas. Several cases of various kinds have been treated by radium, but without the brilliant results reported by some observers.

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THE TREATMENT OF EPITHELIOMA.

Geo. C. Johnston, American Medicine, November 19, 1904.

The results of the treatment of 44 cases of epithelioma by radio-therapy are given. He believes that a large proportion of epitheliomata can be cured by this means alone, if the skill, experience and technique of the operator be adequate to the case in hand. He believes it to be but fair to the treatment to divide patients suffering from epithelioma into two classes. First, those in which owing to location, extent, metastasis, physical condition of the patient, etc., no clinical cure need be expected, and relief of pain, cessation of discharge and prolongation of life alone are hoped for. It is unjust to the treatment to include and classify as failures, absolutely hopeless cases. Second, those cases in which a favorable prognosis may be given and a cure reasonably expected to follow a proper application. Treatment of epitheliomata will give better results than treatment of the various internal malignant growths; being superficial, the affect of treatment can be seen and the dosage correctly adjusted, hence there is much less danger of auto-intoxication. On the other hand many of these cases are recurrent and have been excised, cureted, cauterized, etc., before being submitted to Roentgen ray treatment. Many of these patients being old, with low vitality, the reparative power of the tissue being slow and deficient, nutrition below par, kidneys inadequate, and skin inactive, renders them often unfavorable cases for treatment.

He calls attention to a peculiar irritability of the skin, frequently seen in these cases, which he terms the "epithelioma habit" and describes as a liability to chronic inflammation with overgrowths of horny layers following the slightest injury. His technique, which is capable of adaptation to suit the needs of each particular case, consists in the employment of a self-regulating tube reduced to the lowest point, penetration being secured by series spark gaps and of a degree just sufficient to enter the diseased tissue and pass through it.

An exposure of 10 minutes, at a distance of 8 inches, is given at intervals of two days. Means are employed for the protection of hair and eyes only. The necessity of raying the lymphatics draining the seat of the growth before infection manifests itself is emphasized. Where a case resists all treatment short of a severe burn, such a burn is produced without hesitation, the patient being warned and assent obtained.

He reports cases in some detail and a tabulation shows the average duration 4 years 8 months. Of the 44 cases 33 per cent were recurrent, 67 per cent were primary. The average number of treatments necessary was 22. Metastasis was present in but 3 cases; 18 per cent were benefited, in 7 the disease recurred, in 81 per cent a clinical cure was obtained, 7 per cent terminated fatally.

He believes the most common mistake made in the treatment of epithelioma is the use of a tube of high penetration, and the employment of protective screens. Success depends upon the ability of the operator to limit metastasis and his ability to distinguish an active from a worthless tube. In the judgment of tubes as regards the possession of therapeutic properties, experience in radiotherapy is of the greatest advantage, since the best measurement, the most exact and the most easily read of the efficiency of the radiation from any tube, is its power of producing chemic changes upon a photographic plate.

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Reports of 14 cases of carcinoma of the breast follow, 4 of which were primary and had not been operated upon, 3 are alive, apparently cured, for 18 months; 1 died of bronchitis a year following treatment, the breast at this time being small and painless.

TREATMENT OF MALIGNANT GROWTHS BY X-RAY.

C. H. Wells, Brooklyn Medical Journal, November, 1904.

Wells reports four cases of epithelioma.

The first case (a growth on the lower lip) recurrent after removal; eight months of X-ray treatment effected a cure with no scar.

The second case was an epithelioma of about half an inch in diameter on the left temple. This entirely disappeared after ten-minute exposures to a soft tube three times a week for four months.

Case 3. The epithelioma was on the back of the neck and about two inches in diameter. Treatment, fifteen-minute exposures to a medium hard tube three times a week for four months; then, dermatitis being quite severe, stopped treatment. At the end of three weeks the sore had entirely healed, normal skin having covered its site.

In case 4 there was a sore on the border of the lower lip half an inch long by a quarter of an inch wide that resisted medical treatment for three months. Completely disappeared after sixteen ten-minute exposures given every other day. The author treated also a case of cancer of the penis, but without success. Three cases of carcinoma of the breast were treated. In the first case treatment was begun with ten-minute exposures daily to a hard tube for thirty days, after which treatment was resumed every other day until present time, about nine months in all. The tumor has slowly sloughed away until the open sore extends from the nipple to the axilla, but shows no sign of repair. The patient's general condition improved very much at first, but during the last month she has been growing weaker and appears to be suffering from absorption from the sore.

In another case, where the breast tumor was about as large as a hen's egg, the treatment was with a hard tube three times a week for ten minutes. Dermatitis supervened, but the tumor did not decrease, although the pain ceased.

In still another case of carcinoma the pain was entirely relieved and the tumor became softer.

The results of the writer's experience teach him that most cases of epithelioma will yield to the X-ray after from one to nine months' treatment, according to size of the sore, vitality and age of the patient. In primary carcinoma of the breast it is of doubtful utility. In recurrence after operation in breast cases he has had no experience, but some operators report good results. He found the X-ray of value in some cases non-malignant. One case of keloid: a little girl, aged five, fell and bruised her cheek, causing keloid to develop about three-quarters inch long and one-quarter inch wide. This entirely disappeared after five-minute exposures every other day for forty days.

One case of obdurate acne, a young lady of eighteen: he gave her five-minute exposures three times a week for three months, removing every trace of the eruption.

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THE VALUE OF THE ROENGEN RAYS FOR THE MEDICAL EXPERT.

Dr. Immelman, Ber Klin. Wochenschrift, October 24, 1904.

The author divides his paper, which was read before the Berlin Medical Society, into two parts: The physician as expert in accident insurance and in forensic medicine.

In every accident a Roentgen photograph is necessary which ought to be intrusted to an X-ray specialist. Long experience only is a protection against mistakes, as eg. the presence of an os intermedium cruris which might be taken for a fracture of the astragalus. The certifying physician must remember that the ideal healing of a fracture is very rare and that it is the functional result that is of chief importance.

In forensic medicine the X-ray plays an even more important part. The judge's questions, "What are the sequelae of the injury to the injured?" "Have dangerous tools been employed?" "Can better be employed now?" The X-ray removes any doubt about the presence of bullets, clears the question whether or not a new-born child was only post or intra partum, etc.

The X-ray is valuable also for the military surgeon and for the life insurance examiner. It shows sooner than other methods diseases of the lungs and aneurysms and enables the doctor to state positively whether bullets from former campaigns are still in the body, etc.

Current Electrology and Radiology

(Only articles relating to the above named subjects will be abstracted.)

FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRAHLEN.

Berlin, Germany, October 25th, 1904.

1. The Alternating Current and Its Application in Roentgen Work—Dr. B. Walters.
2. Test to Ascertain the Penetration of Human Tissues by the Roentgen Rays with Reference to its Importance in Ascertaining the Penetration of the Tissues in Radiotherapy—Prof. Dr. G. Perthes.
3. Additional Information Regarding the Functional Disturbances of the Elbow-Joint, with Special Reference to Ulnar Paralysis—Dr. Max Cohen.
4. Multiple Cartilaginous Exostoses of the Hip Shown by the Roentgen Process—Dr. Alban Köhler.
5. Something Concerning the Therapy and the Forensic Opinion Regarding Roentgen Ray Dermatitis—Dr. Leopold Freund.
6. The Surgical Importance of the Rib—Dr. Carl Beck.
7. The Nose Before and After a Leveling Operation Shown by the Radiograph—Dr. R. Stegmann.

1. In this article, Walters deals particularly with the theoretical side of the subject, and after presenting a large number of formulae and arguments, concludes that the alternating current can be used to excite the secondary coil and generate therein a constant current which will produce a spark to the extent of 50 cm. in length. He accomplishes this by passing the current directly into a specially constructed coil without the interposition of an interrupter. He estimates that spark lengths of 10, 20, 30, 40, 50 cm. indicate a maximal tension of 64,000, 108,000, 184,000, 186,000, 216,000 volts respectively. In an article which is to follow he promises to show its application in the Roentgen laboratory.

2. Perthes first calls attenion to the many difficulties that are encountered in the estimation of the effect of the X-ray upon the tissues that are deep. The intensity is affected by the distance of the tissue from the anode, by the absorp-

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tion of part of the rays by the overlying tissues, by the contents of the tissues at the time, and by the quality of the tube. He then carries on an investigation as to the absorptive power of the various tissues of the body as compared with water and aluminum, and finds with the exception of fatty tissue and the lungs that it corresponds very closely with the absorptive power of an equal bulk of water. It was also determined that water 2 cm. deep which would cast an identical shadow with that cast by a definite thickness of aluminum when exposed to a low tube, would be distinctly more dense in comparison when exposed to a high tube. The falling off of the penetrative power of the deeper tissues is less marked if the part exposed is covered with a layer of aluminum one mm. in thickness.

3. By a series of stereoscopic radiographs Cohen determines that there is a physiological cubitus valgus present in women which must be distinguished from that produced by pathological conditions. He reports twelve cases. In six of these cases, a neuritis, or palsy of the ulnar nerve developed long after the original injury. In case 4, the neuritis developed two years after the arthritis which caused a deformity of the elbow joint. In case 6, the neuritis developed nineteen years after the fracture of the internal condyle. In case 7, the symptoms developed fifty-seven years after the fracture of the external condyle, which caused a deformity of the joint. In case 8, the symptoms developed three weeks after a fracture above the condyles. In case 9, the neuritis developed six months after a posterior dislocation which was not properly reduced. In 13, the symptoms developed nineteen years after a fracture of the external condyle.

4. Köhler reviews the literature upon the subject of cartilaginous exostoses, and finds no distinct mention of the affection occurring at the upper extremity of the femur. He then reports a case which had gone the rounds of the various authors and had the diagnosis of rheumatism made. X-ray examination showed a number of exostoses involving other bones, and an exostosis involving and really forming a part of the head of the femur. The patient and his relatives were small in stature, but no hereditary history of exostoses could be obtained nor could any history of rachitis, syphillis, nor tuberculosis be obtained.

5. Many cases of dermatitis have resulted from the folly of purchasing an outfit and thinking it was the only requisite for the purposes of radiotherapy. In the eight years of Freund's radiotherapeutic practice, he has had eight cases of severe Roentgen dermatitis.

The radio activity in the tissues can in part be measured by a radiometer, but there will always remain an individuality in the patient that must be taken into consideration. He reviews the various methods that have been used to assist in the healing of these burns, including lotions, ointments, skin-grafting and amputation. He asks that the patient should be warned that these burns are liable to recur if any irritating applications are made to the affected part. He quotes several cases that have been taken to court, and concludes that according to his experience the danger of a severe dermatitis is not very great.

6. The diagnosis of cervical rib is made by means of the X-ray. The operation for its removal is attended with great difficulties. Beck reports a case in which he resected the rib. The patient made an uneventful recovery, but after

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two-months pain developed in the right side of the neck, which was relieved by the constant current.

7. Stegmann presents two skiagraphs of the nose. One was made before operation upon an actress, and shows the marked projection of the hump on the nose and the bony projection which caused it. The second skiagraph shows the absence of a portion of the bone which was the result of a leveling operation, and also the general improvement in the contour of the nose which followed the operation.

ARCHIVES D'ELECTRICITE MEDICALE.

Bordeaux, France, October, 1904.

1. **The Application of Radio-Therapy to Pruriginous Dermatoses—Dr. G. Belot.**
2. **Physiological Action of Interrupted Currents of Low Tension—Dr. Stephane Leduc.**
3. **Treatment of Cutaneous Epitheliomata by High Frequency Sparks—Dr. H. Bordier.**

1. X-rays are efficacious in the treatment of itching without gross skin lesions, and also when the itching is accompanied by skin lesions. Belot uses tubes giving rays of a low degree of penetration and tries to avoid dematitis. He employs rays corresponding to three or four on Benoist's radiochromometer, and causes to be absorbed at each seance a quantity equal to three or four units according to Holtzknecht's scale. The disease can easily be controlled inside of ten or twelve days. It sometimes recurs after a couple of months, when the treatment should be applied again. The different varieties of affections in which itching constitutes a prominent part are discussed with reference to treatment by X-rays, at some length. Belot thinks very favorably of their future usefulness in these conditions.

2. The continuous current, when applied to the brain and interrupted, will cause phenomena which simulate closely epileptic attacks, even so far as to result in the production of a comatose condition, which the writer dominates electric sleep, sometimes lasting for five hours. This phenomenon which the author denominates experimental epilepsy, and which is thus producible, renders it possible to study the epileptic syndrome upon healthy animals; this form of current is the only form of current which will produce phenomena through which the epileptic syndrome can be studied experimentally.

3. Three cases are reported. A resonator was used, sparks from this apparatus being applied to the whole surface of the ulcer until the tissue commenced to blanche. This blanching of the diseased surface is considered to indicate that the desired effect has been produced, and the surface is then covered with a piece of cotton saturated with an antiseptic solution. This treatment frequently produces healing without a scar. The application usually requires from forty to sixty seconds according to the power of the resonator employed.

First case reported consisted of a wart on the leg about the size of a lentil which had existed eight or ten years. One application caused a considerable reduction in size and one more treatment applied two months later effected its entire disappearance. The second was a case of ulcerated epithelioma on the end of the nose, five millimeters in diameter, of two years and a half standing. One treatment produced entire disappearance in one week. The third was a fungoid epithelioma on the nose projecting from the skin three millimeters, and seven millimeters in diameter. Two applications, eight days apart, caused complete

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disappearance of the growth with resulting healthy skin in the place of it. A solution of the oxycyanide of mercury was applied every day after the first application of the high frequency sparks. Bordier uses this modality with gratifying results in almost all epithelial tumors of the skin.

BULLETIN OFFICIAL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE.

Paris, France, July and August, 1904.

1. **Facial Paralysis treated by Continuous and Induced Currents—Dr. Thielle.**
2. **Atrophy of Muscles of Thigh and Leg treated by Sinusodal Voltaization—Dr. Thielle.**
3. **Phosphaturia treated by Sinusoidal Voltaization—Dr. Thielle.**
4. **The Sinusoidal Current in Diseases of Nutrition—Dr. Thielle.**
5. **Electrization in Painful Moveable Kidney—MM. Laquerriere and Delhern.**
6. **Remarks on the Theory of Madamoiselle Ioteyko regarding the mechanism of the reaction of degeneration—MM. Laquerriere and Delhern.**

1. Two cases are reported. One of complete paralysis of right side of face in a woman fifty years of age, which was followed by cure after ten applications of from ten to fifteen ma. of continuous current, anode at nape of neck, followed by two minutes of light faradization. The second case occurred in a woman thirty-three years of age, was complete and involved the right side of the face. From five to twenty-five ma. were applied for from five to twenty minutes. Thirty applications cured her in three months, but no improvement was manifest until after the seventh sitting. In neither case was modification of sensibility a feature in the symptomatology.

2. The lesion followed a traumatism. Treatment was by hydro-electric baths, twenty-four being given altogether. Six with the undulatory current, and eighteen with the alternating sinusoidal current, extending over a period of six weeks. Complete cure resulted.

3. Four cases of neurasthenia are reported, all of which exhibited phosphaturia, and two of which also exhibited azoturia. Treatment consisted of hydro-electric baths, the alternating sinusoidal current being used, the current volume varying from twenty to sixty-five ma. and the number of treatments required varying from thirty-nine to sixty-five, extending over periods of from three to six months. All of the cases were greatly improved.

4. A very interesting article consisting of exhaustive histories of thirteen cases of sciatica of various origins other than pressure. Treatment was principally by the hydro-electric bath, sinusoidal current being used as follows: Volume varied from fifty to one hundred and ten ma., according to the tolerance of and effect upon the patient, being applied during the first part of the treatment for from twenty to forty-five minutes, when it was reversed and thus applied for fifteen minutes. The cases were of from one month to fifteen years' standing. In four of these cases it was necessary to supplement the sinusoidal current with the continuous current ten to seventy ma., kathode active over the painful spots, faradization, and in two cases by mercury and potassium iodide administered internally. The other nine cases responded favorably to the sinusoidal current in from two weeks to six months, during which period from one to sixty treatments were given. Thielle thinks most favorably of this method of managing sciatica and his opinion is certainly well supported by his results.

5. The first patient was a woman twenty-four years old, the lesion following

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a miscarriage; the painful condition was of five months' standing. Pain was located in loin and abdomen and incapacitated her from doing anything. She was given four static applications without much benefit, then an application of the sinusoidal current, five ma. for five minutes. This was followed by faradism and static sparks, which then caused the pain to disappear at once. During the next year she was treated twenty-five times by static sparks, the treatment being applied only when the pain returned. At the expiration of this time she was entirely well except for some sensitiveness in the lumber region, which came on when she was much fatigued.

In the secod case the sinusoidal current, twenty ma. for ten minutes was applied, which relieved the pain, but the kidney still remained movable. The third case was treated by the sinusoidal current, fifteen ma. for ten minutes; cure resulted after three applications. The fourth case was treated by galvano-faradism, twenty ma. for ten minutes, and afterwards by faradization only for twelve sittings which resulted in cure.

JOURNAL DE PHYSIOTHERAPIE.

Paris, France, October, 1904.

1. **On the Modifications of Electrical Excitability of Nerves and Muscles in Icterus—M. A. Gilbert, P. Lereboullet and S. Albert-Weil.**

1. This article is a very interesting, long, and exhaustive account of experiments undertaken with the purpose of ascertaining what effect the presence of bile in the blood exercises upon muscles and nerves as regards their susceptibility to stimuli. The experiments were conducted upon twelve persons who were afflicted with various diseased conditions involving the presence of bile in the circulation, catarrhal icterus, cirrhosis of liver syphilitic cirrhoses, etc. Both muscles and nerves were found to be rendered hyper-excitable to electrical stimuli, by the icteric condition, but that this hyper-excitability was more marked in the muscles than in the nerves, and usually was manifest in direct proportion to the amount of bilirubin present; that is, the hyper-excitability grew less as the amount of bilirubin in the circulation diminished.

The faradic and galvanic currents were the stimulating agents used, and the facial and median nerves and biceps muscle were the structures investigated. Tracings were made by a registering metronome having two hundred oscillations per minute.

JOURNAL OF ADVANCED THERAPEUTICS.

New York, N. Y., November, 1904.

1. **Some Observations on the Medical Uses of the Continuous Galvanic Current—D. R. Brower, Chicago, Ill.**
2. **Three Cases of Inoperable and Recurrent Sarcoma Successfully Treated by the Roentgen Ray—George C. Johnston, Pittsburg, Pa.**
3. **The Modern Treatment of Stomach Trouble—H. H. Roberts, Lexington, Kentucky.**
4. **X-Ray Treatment of Urethral Carbuncle—G. H. Stover, Denver, Colorado.**
5. **Sensitization of Living Tissues—Margaret A. Cleaves, New York, N. Y. (To be continued.)**
6. **Radiography—Herman Grad.**

1. See the "Archives" for November, 1904.

2. See the "Archives" for November, 1904.

3. Roberts considers a diagnosis of the exact condition which is causing the trouble to be the most important as well as the first step in its treatment. Trans-

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illumination by means of the gastro-diaphane is most valuable for the purpose of recognizing tumors, thickening of the anterior walls, etc.

The X-ray is regarded as of untold value in the diagnosis of stomach troubles. Capsules specially made for the purpose will facilitate greatly the study of the motility of the stomach and can be followed by the X-ray in their courses through the alimentary canal. Stomach washing by means of a tube is also of great value in this connection. As a routine therapeutic measure, however, washing out of the stomach is regarded as not only unscientific, but obnoxious and in many cases positively harmful. When large quantities of mucous are present, water so introduced will not remove the mucus, but will increase the flow by its irritant effect upon the stomach. The possible dangers of introducing the stomach tube are suggested by the mentioning of a case reported by Penzoldt, who had made arrangements to wash out the stomach of a certain patient at a certain time. For some reason the patient did not keep the appointment and that evening died from a rupture of an aortic aneurism into the esophagus, doubtless saving the doctor's reputation and his chagrin.

Dieting is of value in stomach diseases only in so far as that we are thus able to adapt food ingested to that portion of the alimentary canal which is most healthy; the patient is thus given strength and nourishment while the disease condition is being corrected.

Roberts thinks well of the use of electricity in stomach diseases. He applies the high-frequency current by means of a special electrode covered with rubber, which is introduced into the stomach. The current is applied, first, by having the patient drink a few glasses of luke warm water, mildly saline; second, an electrode is applied on the outside over the stomach, and the other internally, and the Oudin current is employed. He regards this method as specially useful when it is desired to obtain the local effects of a current of high voltage.

4. The text of this article indicates that the last word of the title should read Caruncle instead of "Carbuncle."

Stover was led to use the X-ray in the treatment of this disease because of the vascular changes accompanying its application. Two cases are reported. One had existed fifteen years, had been removed three times by the knife during this time. Tumor was the size of the end of the finger, very red and tender; bled easily, and so painful that the patient could not sit comfortably in a chair. She was given twenty-five X-ray exposures, the tube, which was of medium low vacuum, being located at a distance of five inches from the growth, the seances lasting ten minutes each. Size of growth diminished after fourth or fifth exposure and pain became less. At the end of the course of treatment pain and discomfort had disappeared, surface of tumor did not bleed, and had taken on the appearance of normal mucous membrane; some thickening of tissue was still present.

Second case was recurrent after removal six years previously; great soreness and pain in walking and during urination were present. Six exposures of ten minutes each, a tube of fairly low vacuum being used at a distance of six inches, were given during a period of three weeks. After the fourth exposure, patient had no more pain or soreness.

6. Advanced sheets of the chapter on Radiography and Radio-Therapy to

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appear in Conservative Gynecology by Dr. G. Betton Massey, to be published by the F. A. Davis Co. of Philadelphia, Pa. Developers for the X-ray plate are briefly described, the Metol-Hydrochinone being considered as serviceable as any. Grad states that absolute familiarity with normal X-ray appearances of the various anatomic parts of the human skeleton are necessary before it is permissible to interpret pathological appearances. Radiographs should always be taken in at least two projection planes. An X-ray plate may show a defective anatomic result, yet the functional results may be very good. This must be remembered in interpreting X-ray pictures.

ARCHIVES OF THE ROENTGEN RAY.

London, England, November, 1904.

1. On Electric Methods of Local Medication—Clarence A Wright.
2. On the Use of Hydro-Electric Methods in Medical Practice (to be continued)—Sydney Whitaker.
3. The X-Ray in Tubercular and Malignant Diseases—J. D. Gibson.
4. Report on Radiotherapy—R. Kienboeck.

1. Wright sets forth at considerable length the electro-chemistry of solutions as involved in the process of phoresis. The article is too technical for profitable abstraction.

3. Gibson insists that in small superficial malignant growths and ulcerations the X-ray can almost be regarded as a specific. With deep-seated malignant growths of the internal organs, sarcomas of the jaw, uterus, and rectum, the conditions are quite different. Powerful machines giving rays of great penetration are required, and it is held that few X-ray workers comparatively have machines creating enough energy to reach the depth of these malignant processes, with sufficient force to destroy them.

The writer believes that malignant conditions return after apparent cure because of a too low vacuum of the tube used, the rays from which fail to energetically penetrate to the depth of the disease area. In the treatment of cancer, therefore, he believes in using a tube of sufficiently high vacuum to illuminate well, and to carry the full physiological effects of the rays well below or deeper than the processes of the new growth. He believes also in fluorescing the tissues, and uses mostly for this purpose the bisulphate of quinine. What is most needed in the use of the X-rays is an instrument for measuring their penetration that will obviate the difficulties of comparing technique and allow all operators to arrive at the same conclusion, suggests the use of a common instrument of measurement, like Walter's skiameter, which has six holes whereby rays of six different intensities can be measured. When it shows six openings in the fluoroscope, you have a ray that will take a skiagraph of an ordinary chest in five seconds. The operator who uses a machine sufficiently strong to illuminate a body with light sufficient for any penetration, and adjusts his light to suit the various conditions he is called on to treat, will have the best success in the treatment of cancer by the X-ray, whether it be a surface affection, or one met with in the abdominal cavity, the triangles of the neck, the mediastinum, etc. To avoid sepsis is one of the great problems to be solved; it may be accomplished by a proper regulation of the length and frequency of the exposures. The patient's general condition must be watched and the treatment not pushed faster than he can stand.

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Tuberculosis he regards as offering a favorable field for X-ray work. In treating pulmonary tuberculosis the trouble "generally has been imperfect tubes, or, rather, rays of insufficient penetration, which are unequal to the task required of them after penetrating the sides and chest walls. If after penetrating the ribs we still have as much energy left in the ray as we got from the lower tubes on the surface, why should we not get equally good results?

"Another point where we have been committing errors in the past is to treat with the avowed purpose of killing the bacilli by means of the ray.

"We notice in treating cancerous conditions, particularly those of the breast, that the use of the ray gives rise to hypertrophy of the part treated, its blood-supply and nutrition being greatly increased. Later on, when the ray is pushed, we have an atrophy and destruction of the tissue.

"Now, in the treatment of tuberculosis pulmonalis especially, we wish to produce this hypertrophic condition, as the increased nutrition and larger blood supply enables the tissues to throw off and destroy the bacilli themselves. If the treatment is pushed to the point near destruction or enfeeblement of the tissue, the object aimed at is defeated and the condition made worse."

He believes the ray is liable, if there is mixed infection or if there is very much sepsis with fever, to raise the fever and accentuate the condition.

In sanitarium work he does not consider "a moderate increase of temperature an absolute indication for the cessation of treatment, as with judicious care it may sometimes be pursued with great benefit to the patient. In office work all cases with much fever are out of the question for treatment by means of the X-ray; rest in these cases is absolutely essential, and the worry of going back and forth to the office does more harm than any treatment can do good."

The writer claims some excellent results from the use of antistreptococcic serum, and thinks in the early cases of tuberculosis, that the use of this serum in the mixed cases will control the fever, and enable the patient to stand the X-ray exposure much sooner than possible without it.

4. See abstract of article in "Fortschritte auf dem Gebiete der Roentgen-Strahlen" on the same subject by the same author, page 429, Archives of Electrology and Radiology, November, 1904.

Book Review.

From the review of "High Frequency Currents and Finsen Light Therapy," by John McIntosh, published in the November issue of the "Archives," the name and address of the publishers was inadvertently omitted. The book is published by the Western X-Ray & Coil Co. of Chicago, Ill.

PHYSICAL THERAPEUTICS IN THE LIGHT OF NATURAL SCIENCES.

Gustav Fischer, Jena, 1904.

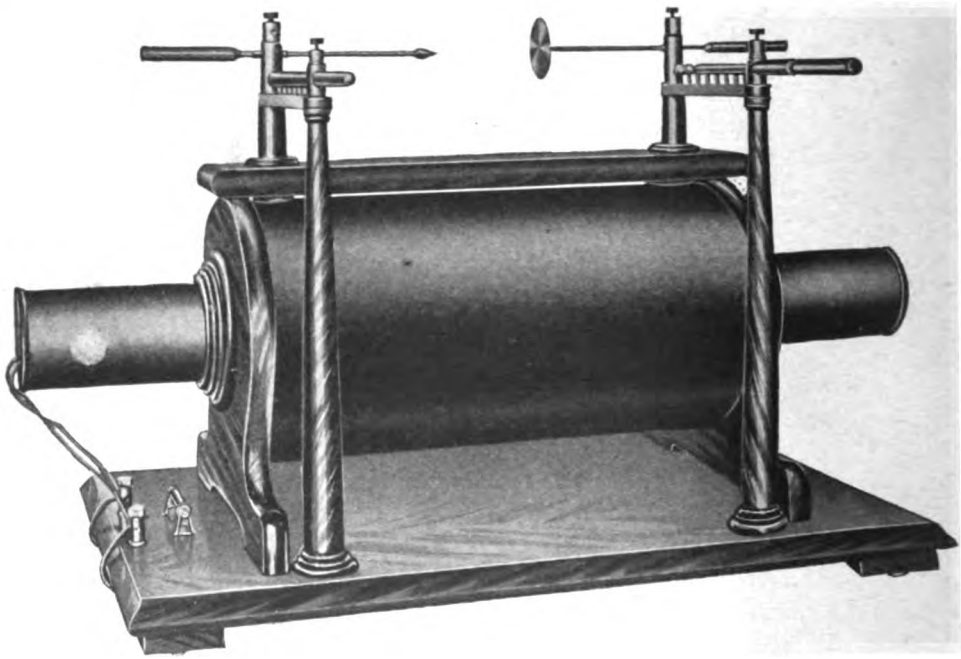
This little brochure is written mainly in defence of physical therapeutics. To the thinking scientist (it seems to us) this is not necessary, and to the others such appeal is of no use. The parts of interest to the readers of the "Archives" are the chapter on Light and Electricity as a Curative Factor. Both are very short and present nothing new.

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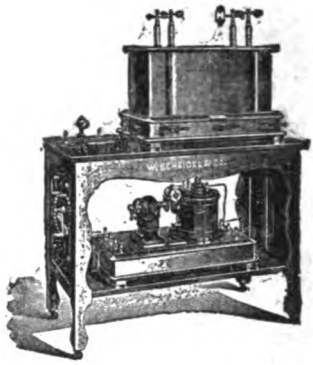
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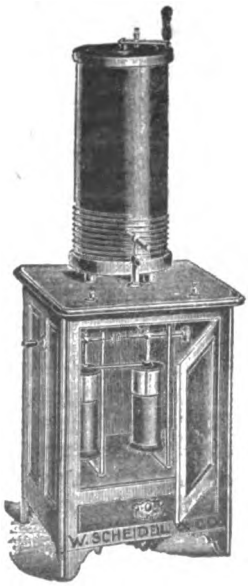
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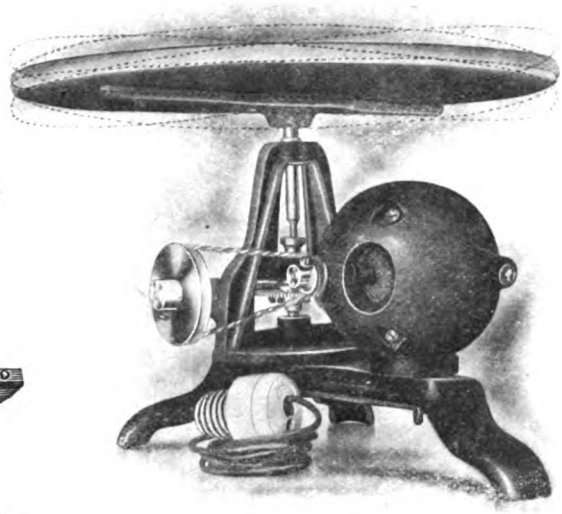
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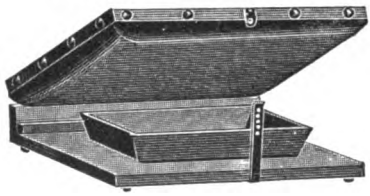
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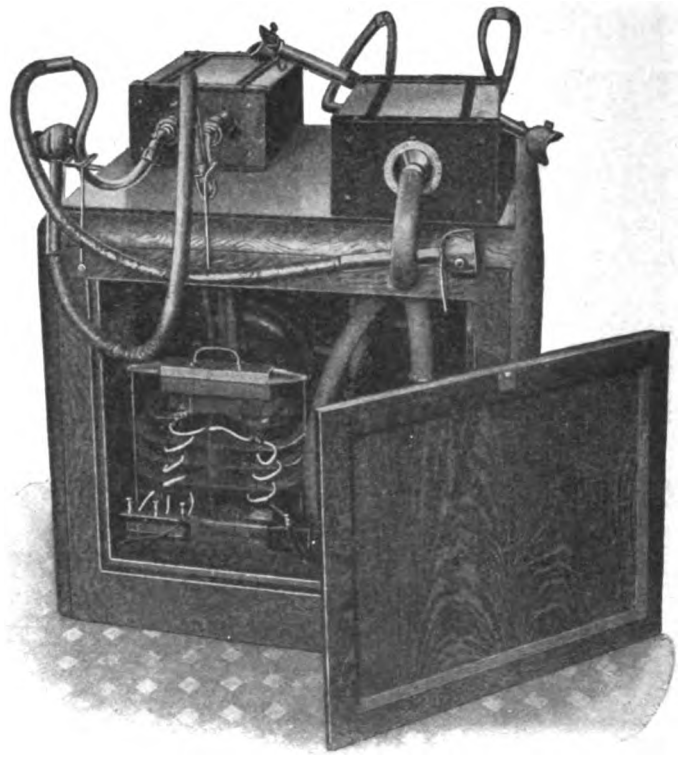
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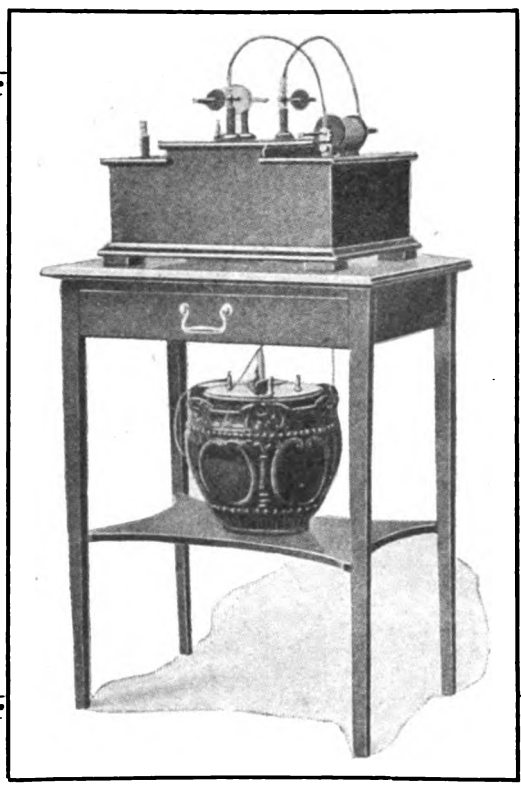
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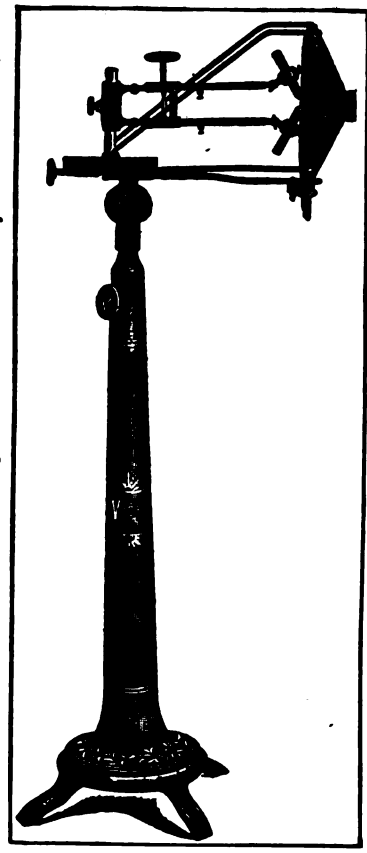
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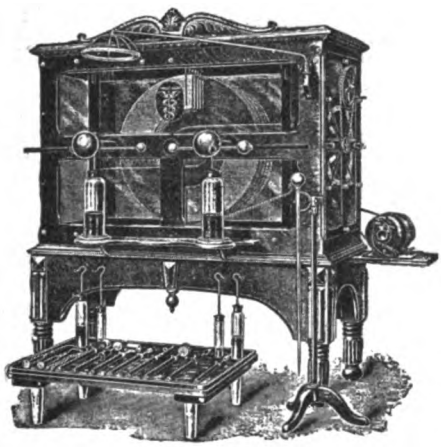
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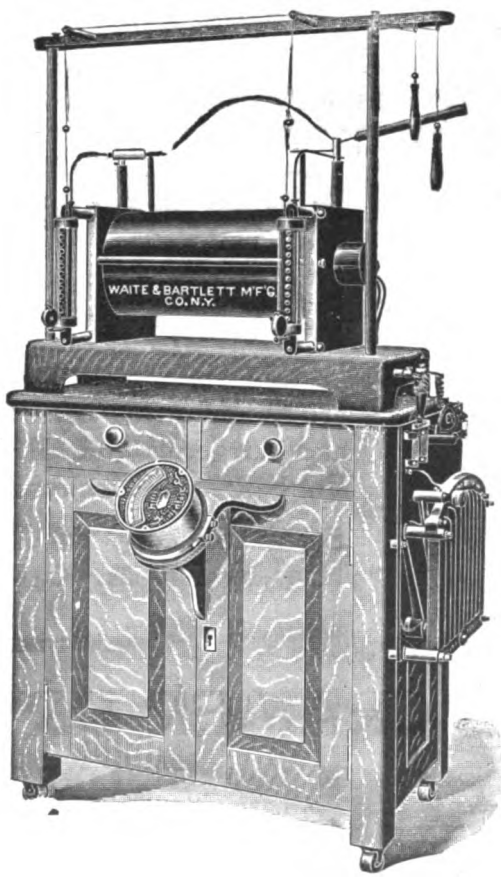
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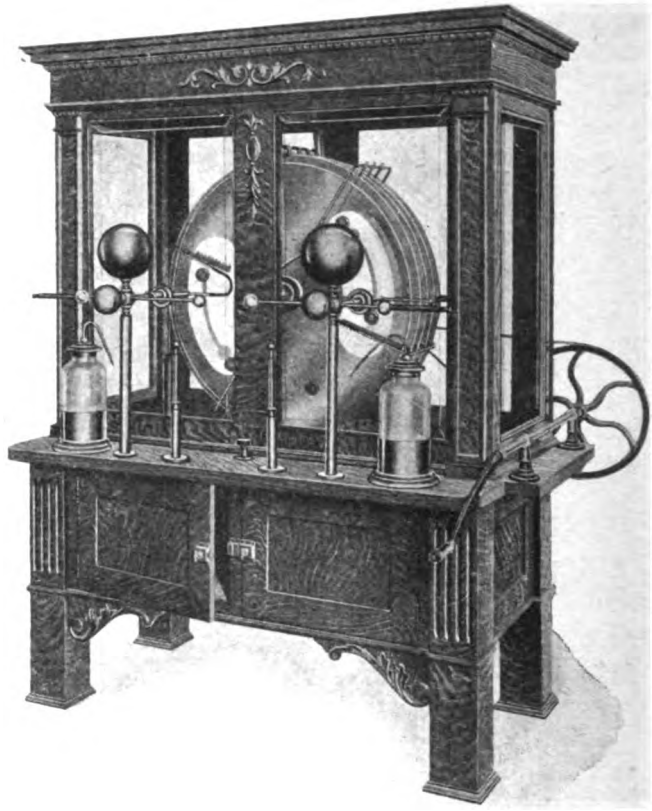
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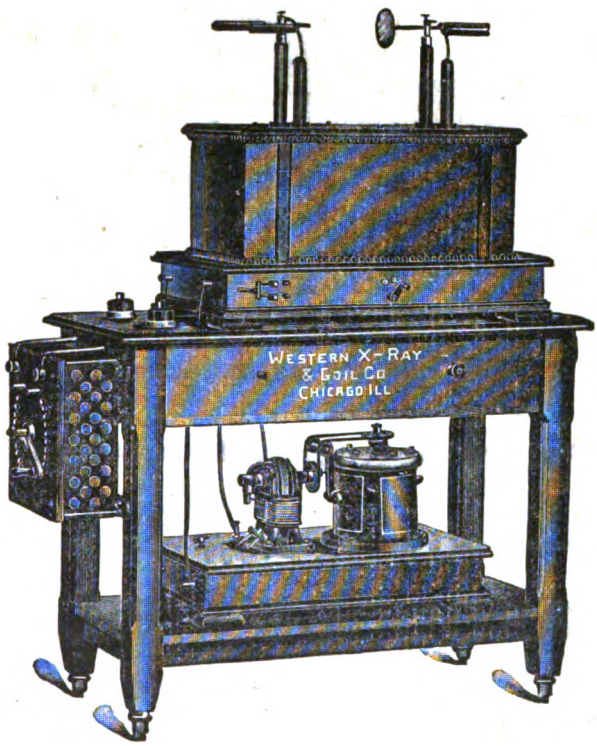
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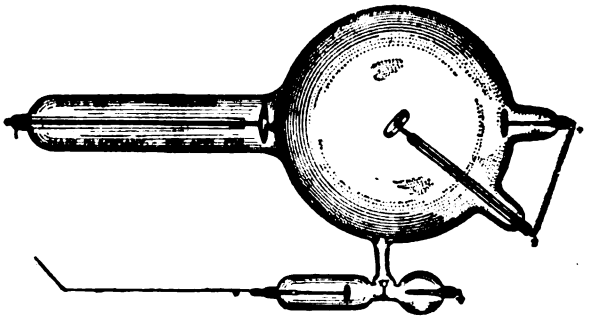
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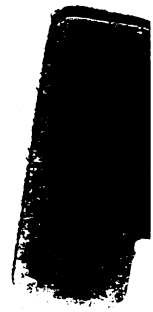
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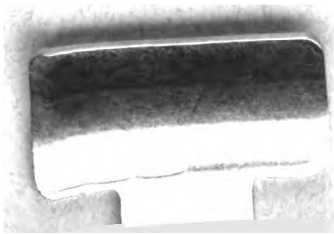
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